American Railroad Journal.

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THE IMPORTANCE OF PROPER LUBRICATION ON RAILWAYS.

BY E. F. DIETERICHS.

[Written for the AMERICAN RAILROAD JOURNAL.]

MANY appropriate remarks have been made as to how very little things can become the cause of serious accidents on railways. Breaking of axles, car-wheels, rails and parts of machinery is caused from unequal strain or defects of the materials so little as to be easily overlooked or brought about through inaccuracy of workmanship apparently so slight as to be put aside as trivial. Rails not properly and evenly secured on imperfect foundation, axles and wheels and machinery not in proper bearing to each other, irregularly loaded with changing weight and under rough usage generally soon deteriorate in their weakest parts and become liable to sudden breakage. The constant vibration and jarring, together with the continuous expansion and contraction under changing temperatures from natural influences and from friction, gradually disintigrate the metal and weaken its strenght to final breakage.

To prevent accidents from such causes, the remedy lies in purchasing material of the very best quality, employing the very best of skilled labor and using the utmost care in handling, and keeping in as perfect order as possible all parts in any way subject to the influences mentioned. Another point, also usually but little considered, is the lubricating of rolling-stock and machinery; yet small as this point may appear, its neglect can be the cause of serious accidents, and it requires just as much attention as the points mentioned above.

As it is the first consideration with rails, axles, car-wheels and machinery, to guard against primary causes of accidents by selecting the very best material and the best experience and workmanship, so also none but the very best of lubricants should be selected and be applied intelligently. Purchasing and using lubricants of poor material and made by parties solely bent on gain and ignorant of the principles of lubricating and the character of the material used, is equal to the purchasing of poor steel or iron and its working by careless, ignorant and unskilled labor. Accidents resulting from such practices cannot be called non-preventable accidents.

Lubricating with the very best material cannot prevent overheating and consequent injury to the parts and accidental breaks when the parts are either defective in material or mechanically untrue from careless and poor workmansnip or rough usage. No lubricant, however pure and efficient, can make a bearing run true and prevent its heating when out of line, too tight in fit or otherwise defective, or so constructed as not to allow the lubricant to reach freely those places where its work is expected to be done. A lubricant cannot remedy the mechanical defects in cylinders or valve-chests; it cannot prevent cutting when rods are out of line and rings not properly set or worn into ragged edges. The purer the lubricant, the better in quality and the more efficient on scientific principles, the more perfect mechanical construction is necessary to its perfect practical working. Proper time for consideration and thorough study of the subject of lubricating and lubricants should be given by those in charge and whose presumed greater intelligence over the ordinary employé should enable them to comprehend more fully the equal importance of closer attention to this subject, as a great factor in apparently trivial causes of breakage and accidents. It will be found worth while to enumerate and consider a few of the more pertinent points on this interesting and important subject.

Most engineers remember when tallow was universally used as a lubricant in locomotive-cylinders, and no argument against the custom was capable of convincing intelligent mechanics that it was a poor lubricant. At every overhauling of the engine hard and heavy black gummy deposits were found in valve-chest and cylinder, and in time the ravages made on the metal by the fatty acids became more and more perceptible, the iron, especially when of poor quality, fairly becoming honeycombed. In the application of tallow as a lubricant, small quantities of it are introduced into the cylinder at regular intervals and are speedily acted upon by the hot steam under pressure. This sets the lighter fatty acids free and separates them from the heavier and solid stearine, which forms the gummy deposits—a black conglomeration of stearine with particles of abraided iron. These conglomerations steadily increase and, soft at first, are baked harder and harder by the dry heat retained in the metal after every laying off of the engine. Frequently they accumulate so rapidly and to such an extent that particles breaking loose are often found behind the rings in the shape of round balls formed by being rolled back and forth with the motion of the follower.

After tallow, lard-oil became the leading lubricant and when pure gave better satisfaction than tallow. But lard-oil and all fatty oils decompose likewise under influence of steam and pressure in the cylinder, and form gummy deposits, although their defects are less perceptible and their practical demonstration requires more time, and engineers that were accustomed to the use of such a thick, heavy and dragging lubricant as tallow, could not readily change all at once to something of different characteristics.

Later, mineral oils were used, mixed with tallow, lard-oil and other fatty oils, and frequently and most injudiciously with drying oils; but the defects were only reduced to the amount of the admixture and the demonstration of

it longer delayed. Recently the filtered mineral oils were brought into use, and while they are less injurious to metal, their too volatile character has not permitted the realization of what was expected and promised of them as cylinder lubricants. Then they were applied with an admixture of fatty oils and the individual defects of the latter were again presented.

All such thick and gummy oils, as well as tallow, fill the intervening space between the cylinder-shell and the follower and will allow the running with loosely fitting rings, but they cause dragging and thereby lose power and fuel. Lubricants of proper consistency, but unable to decompose and form gummy deposits, will ease the motion, permit a closer setting and tighter fit, and economize power and fuel.

Mankind is much inclined to onesidedness or crazes, epidemic-like, and often it needs but skillful advertising and bold representation to draw the people to follow a lead blindly, however contrary to reason and fact. So it is with the subject of lubricating and lubricants which offers such a large field for misrepresentation and misappreciation; so helpful to sharpers who embark in the business wholly incapable but for what in these days is called pluck and ability. Skillful mechanics cannot be manufactured to order and at short notice; it requires experience, close observation and steady application for a numbers of years to become such. So also the manufacturer of lubricants must be brought up to his trade, not by merely imitating what others are doing, but by study, experience and close application to the business for a number of years. The mere mixing, compounding and indiscriminate selling of lubricants may deceive those who cannot or do not care to appreciate real merit and efficiency, but they cannot equal the products of skilled labor.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,
SECRETARY STATE BOARD OF HEALTH OF LOUISIANA.

[Written for the AMERICAN RAILROAD JOURNAL.]

SECOND SERIES.—THE UNITED STATES.

V. RAILWAYS EAST OF THE MISSISSIPPI RIVER.

THE ILLINOIS CENTRAL RAILROAD COMPANY'S

medical service dates from 1878, and was organized for the special and almost sole object of affording surgical relief to passengers and employés injured anywhere upon its lines. The staff consists of a superintending surgeon and assistant district surgeons at the most important points, and local surgeons at most of the stations from Sioux City and Chicago to New Orleans. The last class are remunerated according to a fee-bill for services actually rendered; the others receive fixed salaries.

For injuries received in discharge of duty, and no others, employés enjoy the privileges of this service, which is solely at the charge of the company. Patients are sent to civil hospitals at the discretion of surgeons and with their own consent. No provision is made for medical attendance in ordinary sickness, nor for the families of employés. District and local surgeons report all cases treated by them to the superintending surgeon at Chicago, on printed forms.

Locomotive engineers and firemen on the divisions of the road in Illinois and Iowa are examined for visual power and color perception. This is the full scope of the examination, and it has not been put in practice south of the Ohio river.

I am informed by the superintending surgeon, Dr. John E. Owens, that this system affords great satisfaction to employés, and that it is not expensive to the company. Also that "donations are often made to relieve the necessities of married worthy employés, their widows and families;" and that employés, so far, do not favor independent organizations among themselves for mutual relief. It is evident that this service, up to its narrow limits, is very well organized and administered, and has a staff in readiness for expansion of its functions so soon as the management may adopt the policy.

THE CHICAGO, BURLINGTON AND QUINCY RAILROAD COMPANY

employs a firm of physicians, at a fixed salary, to superintend its medical affairs. Physicians are selected at all important towns to attend solely to surgical cases resulting from accidental injuries of employés and passengers. "Any bills for medical services are paid by the company, or by the person injured;" from which it may be inferred that the company's medical policy is governed by its legal responsibility. A hospital has been established at Burlington, Iowa, for the benefit of those injured upon the road.

There is no systematic examination of any class of employés, nor sanitary supervision of *personnel* or property of the company. There seems to be no voluntary organization for mutual relief and assistance among the employés of the company, but "individual employés insure in various ways."

"Live-stock is unloaded and fed in the company's yards at regular intervals;" no other regulations are mentioned.

The above service, "such as we have, has been in effect ten years."

THE CHICAGO AND NORTHWESTERN RAILWAY COMPANY

organized a medical service in 1865, with a general surgeon and assistants residing at central points, who receive salaries. Their duty is to attend persons injured by accidents. No contributions are required of employés, nor has the company any hospital of its own. No physical examination of employés is made, it being presumed that a man who is not run over and killed by others will be equally considerate on his own part.

The company grants relief "in all worthy cases" to the families of employés in cases of injury, sickness or death. No voluntary associations of men are reported.

It is said that regulations exist relative to transportation of live-stock, to prevent overcrowding, deprivation of food and water, too long confinement, or admission of diseased animals to cars for transportion; but no particulars are stated.

The personal hygiene of employés and the sanitary condition of railway carriages, buildings, grounds, etc., are said to receive attention, but no details are given.

THE BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY COMPANY

has a medical service which was organized in 1876, of similar method and scope to the preceding. No provision is made for relief of families of employés. Legal enactments alone govern the transportation of live-stock.

THE CENTRAL RAILROAD OF GEORGIA,

since 1880, has engaged surgeons at the principal points to attend employés suffering from accidental injuries. They are paid by the company the ordinary fees of private practice, and no question of individual fault is raised in giving relief. There are no hospital arrangements, no physical examination of employés, no sanitary regulations and no separate organizations for mutual assistance among employés.

THE CHESAPEAKE AND OHIO RAILROAD COMPANY,

in 1883, organized a medical service for the relief of passengers and employés injured by any casualties of travel or duty. The staff consists of a chief surgeon, appointed by the general manager, and district and local surgeons at various points along the lines. There is no assessment upon employés, as the service does not extend to ordinary cases of sickness. The company has no hospital of its own, but has special arrangements with local hospitals at Richmond, Va., White Sulphur Springs, W. Va., Lexington, and Covington, Ky.

It is apparent that the medical service of the above-named companies is intended chiefly, if not solely, to obviate expensive litigation with persons injured by railway accidents. By this means the work of the law department is materially lightened. On the lines of the Vanderbilt system and on all the railways of New England the first step to an organized medical service is not yet taken. There the surgical expenses of accidents are settled altogether by the legal profession, and it is safe to conclude that the temple of justice, like the Roman temple of Janus, is rarely closed.

THE FITTING UP OF LOCOMOTIVE LINKS.

BY FRANK C. SMITH.

[Written for the AMERICAN RAILROAD JOURNAL.]

I NOTICE in the issue of a contemporary a communication on slotting links in which the writer says, "in repairing, however, the built-up (skeleton link) is probably the cheapest, as the two halves can be let together to take up the wear, instead of having to put a new link block in."

Not only the writer of the article but the editor of the paper are evidently not aware of the fact that roads repair or take up the lost motion in solid links without fitting new blocks, by heating the ends of the link and dipping them several times in water up to the lines *a b* and *c d*, shown in Fig. 2 of the accompanying cuts, thus "closing" the link by the contraction of the ends. Where this method will not close them sufficiently, they may be heated and the ends placed on an anvil *c*, and closed with a few blows of a flatter *a*, placed as shown in Fig. 3. Several large roads use a press especially arranged to close the link by pressure. The saddle-holes, of course, have to be "oblonged" a little to allow for the closing of the link.

Where a shop is not fitted with a slotting machine and it is desired to use some other tool than the planer or slotter for finishing links, the plan shown in Fig. 1, for using a shaping machine or compound planer, will be found valuable. I have never seen it used save in one shop and it is not generally known. *d* is the link fastened in the chuck of a shaping machine; *e* the tool, looking at the machine from its front; *f* the bed; *a* the cross-feed screw, and *c* the cross-head. To the bed or table of the shaper *b*, a lug *j*, is fastened, which is attached to a sleeve *i*, having a set-screw for fastening it to a bar *h*. At one end of this bar is a slide or cross-head *k*, which may slide

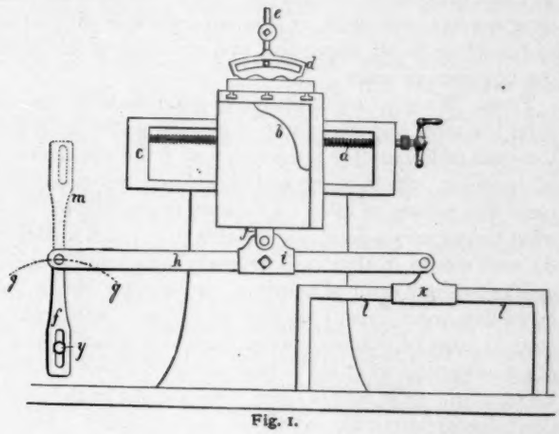


Fig. 1.

Fig. 2.

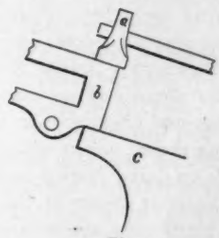


Fig. 3.

back and forth in the guide *l*. At the other end is an arm *f*, capable of rotating in a stud *y*, its upper end moving through the arc *g g*. The clamping-nuts of the cross-head *c*, are loosened so that the cross-head may slide on its ways up and down. The principle of the device is that each portion of the bar *h*, nearer to the cross-head *k*, will move through a flatter arc than that due to the length of the arm *f*. It is therefore only necessary to adjust the bar, by sliding it through the sleeve *i*, until a point is found on it which causes the point of the tool to follow the arc described on the link, and bolt it fast. As the table *b*, is fed across by the screw *a*, and is fastened to the bar *h*, it is evident that it, with the cross-head *c*, will follow the arc described by the sleeve *i*. If the arm *f*, be reversed, as shown by the dotted lines *m*, the curve will be reversed.

THE OUTSIDE PAINTING AND VARNISHING OF PASSENGER-CARS.

BY WILLIAM DAVIS.

[A Paper read before the recent Convention of the Master Car-Painters' Association.]

I WILL endeavor in this paper to lay before you a few thoughts on the outside painting of a passenger-car. It is somewhat embarrassing to me to lay before you or embody in those thoughts anything that may enlighten you, as we have discussed the outside painting of passenger-cars time and again, as well as given the modus operandi employed by different car-painters, and yet, gentlemen, what decision have we arrived at as an association? Have we arrived at a uniformity in this matter? I will venture to say that there is just as much difference of opinion now as there was years ago under these circumstances. I will only speak or, as it were, generalize, on a few points in connection with this subject, and if possible see what progress has been made by this association in the matters of beauty of finish, durability, and economy in the painting of passenger-cars.

First. We will take a glance at what many of us consider the most important step of all, and which is, in fact, the basis or foundation upon which we build the structure of painting, ornamenting and varnishing our passenger-cars—the primer or filler. I have no doubt that all know what constitutes a good and reliable filler; and unless we do, and see to it that it is properly mixed and properly applied, all our labor of painting, etc., will be useless, and inevitable troubles will be sure to follow. Now, gentlemen, as most of you are aware, there is a great diversity of opinion as to what is the best primer. Some advocate lead and oil, while others again advocate one or another of the different patent fillers that are in the market. Should we not be a little cautious how we accept the latter? They may be good; but unless we know their formulas or thoroughly know their component parts and have tested them, and are assured by these means that they are better and cheaper than our old standards, we should not adopt them; on the other hand, if they are good, we would only be doing justice to all to adopt their use.

We next come to the surfacing or rough-stuff. How far, gentlemen, are we a unit in this matter? Some claim that scraping is the best, others some patent surface, while the rest adhere to the old-time method of rough-stuff, and a few don't believe in a great amount of surfacing, claiming that it is the chief cause of blistering, cracking, and in fact, mostly all the deviltries that a car is heir to. Now, while the writer agrees with the necessity of surfacing, and, in fact, cannot see well how it can be done without, yet if there is any trouble arising from this cause it is invariably the fault of the painter; and I have no doubt that a great amount of the cracking, blistering, etc., is caused by the injudicious mixing of rough-stuff as well as the method of rubbing. We are very apt to lay the blame on the varnish; and I may say here that it is a good job for us that the varnish-makers and their agents are a long-suffering people, willing to bear the burden of others on their shoulders, or we might long ago have been wiped out of existence. We cannot use too great care in mixing our rough-stuff or surfacer. It should be mixed as elastic as time will permit, and rubbed as close as possible, being careful not to rub through to the wood, and after the rubbing is com leted care should be taken as to the nature of the next coat of paint we put over the surfacing coat. This coat of paint should be elastic enough to allow the surfacing coat to absorb all it requires to fill up its porous and spongy nature, and yet have sufficient binding properties to form a good, hard, solid surface to put our finishing or color coats upon. I believe some put their flat, hard color coats on top of their surfacing coat, and whatever small amount of vehicle there was in the first color coat is absorbed by the porous nature of the surface coat, and thus nearly all affinity between the two coats is lost, and in time flaking necessarily follows.

I shall next give my ideas on the color coats in this part of the work. I have no doubt some will differ from me in opinion. My own opinion is that instead of making your color coats a dead flat by mixing them only with turpentine, a small portion of oil or finishing varnish should be added, just sufficient to bind your colors and allow of their falling down nicely. Do I believe in the method of putting on two coats in one day? By all means I think we should allow twelve hours at least between coats, and more if possible. By adopting this plan I get a good surface on which to do all my ornamental work, and besides, while the striping and ornamenting are going on on the flat color coats, time is given for the whole to harden.

Very little can be said here on the subject of ornamentation, but I am pleased to say that there is a very marked improvement both in regard to quantity and quality. It shows very bad taste and very poor economy to cover our cars indiscriminately with ornamental work without due regard to thought and character. Would it not be better to confine the ornamentation to the most prominent parts, such as corner-posts and sign-boards, etc.? We should also give attention to harmony of colors. For instance, let the sash, corner-posts and sign-boards be in harmony with the body of the car, The harmony of coloring is a beautiful study, of which we should all avail ourselves, as it will well repay us for the trouble.

And now we come to the last process necessary for the finish of our passenger-cars—varnishing. There has been a great deal written and said on the deviltries of varnish, and truly their name is legion; and as I said before the varnish-maker comes in for a great share of blame, and perhaps unjustly so. But I need not say more on this subject; you are all aware of the troubles and annoyances incidental to varnishing. As far as I am concerned I have very little trouble—only what is incidental to changes of atmosphere and others that we have no control of. Many of you use outside rubbing varnish; so did I, several years ago, but I have discarded its use nearly altogether, using finishing varnish with a small portion of rubbing added, and upon this coat I rub very lightly—just sufficient to take off the nibs—using, at the same time, a rubbing brush that we have made for the purpose. I finish up with two coats of finishing varnish. Thus you will see I insure durability as well as economy, as I believe troubles will arise by the too frequent use of rubbing varnish on the outside of passenger-cars. And now, gentlemen, I will say in conclusion that unless we can study the theory or science in painting, to a certain extent.

as well as have the practical part, we will not be able to arrive at a standard method of painting a car, or understand what has been the cause of these troubles that we have to contend with; for it is an old saying that "every effect has a cause," and unless we set our minds to study these things we will have always to contend with failures. But, on the other hand, he only who studies all these effects, as well as the true beauty of ornament, and also the science of coloring (for the harmony of color is a theory or science in itself) can prove successful in painting and decorating our passenger-cars.

THE QUESTION OF BRAKES.

RAILWAY managers are now called upon to consider the numerous advantages of power-brakes for freight-locomotives and automatic brakes for freight-cars in comparison with the old-fashioned hand-brakes. If economy and a reasonable regard for the safety of human life alike demand that the old should give place to the new, no false ideas of conservatism or expense should delay the desirable movement.

The importance of the ability to stop freight-trains quickly cannot be overestimated. The number of such trains and the rate of speed have been largely increased during the last fifteen years and although by careful watching, and the use of the telegraph and electrical and other signals, the danger of accidents has been lessened, collisions are still of too frequent occurrence. In spite of the most careful management trains run into each other and life and property are destroyed.

If quicker stops could be made, fewer accidents on account of obstructions would happen. Every company now has a long list of claims to settle for stock killed or injured, which would be lessened, if engineers were able to better control their trains. The stops at stations, crossings and water-tanks consume more time because the heavy trains must slacken up when far away from the halting place. This is especially the case when on a down grade.

Freight and equipment are seriously injured by the violent shocks they receive when the trains are being made up. Besides the loss of time consumed in shunting, the locomotives and cars are bruised and injured and the brakemen exposed to greater risks, all because the unwieldy switch-engines have no power-brakes to control their movements.

It may be remarked here that, while the old-fashioned hand-brakes are better than nothing, they are entirely inadequate for their intended purpose. Possibly they did moderately well in the old times when the freight-cars were light and the locomotives small and imperfect. Now the cars are loaded twice as heavily as ten years ago and the locomotives weigh two or three times as much. In consequence of this greater power in the engines the trains are larger. But the grades of the roads have not been reduced nor has the power of the brakes been increased. The results can be inferred.

One of the greatest defects of the hand-brakes was the inability to apply them quickly in case of emergency. When the brakemen were at their posts in approaching stations stops were made with reasonable promptness, but when the danger signal was given out on the road it almost invariably found the brakemen in the caboose. Hasten as they might, it was several minutes before they could set any brakes at all. If the train was made up of open cars loaded with machinery or lumber, progress was slower and risk to life greater. When the brakes were ready to be applied the train was in the ditch or the cart piled up on the track.

Right here may be noted the powerlessness of the hand-brakes to protect life. The brakemen always have taken their lives in their hands. If the night was dark or stormy, or the tops of the cars slippery with ice and snow or rain, the brakemen had to crawl along the tops of the cars with the greatest caution, and even then many a gallant fellow went down to death. What an idle form when an obstruction was suddenly sighted on a dark, stormy night to call for the brakes!

The damage to equipment caused by this lack of power in the brakes was, and is, in the aggregate enormous. Whenever an obstruction was met or a sudden stop from any reason became necessary, the engineer would reverse his engine, The effects of this were dangerous in the extreme, for drawheads and bumpers were broken, trucks were thrown out, train-men killed, and the sparks and cinders in the steam-chest and cylinders, cutting and roughening the smooth surfaces and valves, did serious injury to the locomotive. In making up trains and in switching the same destructive effects were noted. If rough usage is ever to be found it is seen in every yard and terminal station. The wonder is that equipment is not damaged more.

The loss of time on account of these defective brakes in the aggregate amounts to hours and days. A few minutes unnecessary delay of every freight-train at every stopping-place causes a large per cent. of additional expense. Clear it is from these facts that some appliances were needed whereby these defects might be cured and the evils remedied. The tests and experience of the past year seem to show conclusively that power-brakes for freight-locomotives and automatic brakes for freight-cars have been discovered, which do substantially all that is desired of them. The advantages of these appliances are numerous, and the first one is that, while comparatively inexpensive, they do their work infinitely better. The wear and tear is much less and the saving amounts to thousands of dollars annually.

The demand of the times is for fast freight-trains. On the important through lines through freights make passenger time. Now recollect the deficiencies of the hand-brakes and the necessities for quick stops, and consider how this increase in the speed of trains increases the dangers to the crews, to passenger-trains and to property of the companies generally. What chance does a heavy freight on a down grade stand of coming to a halt if an obstacle is met? What chance do the crew have for their lives when the danger whistle sounds?

As these heavy trains rush over the road how can they halt at the stations and crossings without a long preparation? At the tanks and coal chutes there is generally considerable backing and pulling before the right position is reached. With the power and automatic brakes all this is avoided, and the stops are made twice as quickly and easily. It is estimated by reliable authority that, in making up trains and in switching, an engine having the

power-brakes will handle fifty per cent. more cars than one without these appliances. The consequent saving in the wear and tear of equipment is enormous. With the hand-brakes it is believed that every time a train goes over the road the loss of wear and breakage and loss of link-pins and couplers amounts to $10 or $15. With the automatic and power brakes this cost is reduced to a minimum. One year's savings would apply the new inventions. If the trains could stop quickly less stock would be killed and fewer collisions would occur or derailments happen.

And what shall be said of the protection to human life to be caused by the general application of these new brakes, giving the engineer control of his train? Is this to be estimated in money? Surely for this saving, if no other reason, the new appliances must come into universal use. Thoughtful railway men must be convinced by these facts that self-interest and a slight regard for economy as well as a decent respect for humanity demand the application of these power and automatic freight-train brakes. When the change is made all will wonder how they ever did without them, for they will be considered indispensable. The time for this change and the adoption of these appliances has come.—*Railway Register.*

AMERICAN LOCOMOTIVES OF 1885.

DURING the year 1885 there were fewer locomotives built in the United States and Canada than in any year since 1880. By correspondence with locomotive-builders and the leading master mechanics, we have obtained a fair approximation of the number of engines built throughout the country, although there was very great reluctance displayed in many quarters to reveal the limited extent of production. Seven of the leading builders sold 616 locomotives during the year, and it is a liberal estimate to credit the builders who declined to let their production be known, and the various railroad shops, with 200 more locomotives. This would bring the full list to about 800. Of the engines built, 83 were for export, leaving about 717 to supply the home demand. Two years ago, the seven builders that turned out 616 locomotives last year, built 1,346 engines, and the trade was beginning to grow depressed then. But in that year 282 locomotives were exported from the United States, the whole being valued at nearly three millions of dollars. The condition of matters abroad that reduced our exports to their present dimensions, indicates serious depression in foreign railroads as well as among our own.

The intense depression in our locomotive-building has not been caused by the railroads being overstocked with motive power, for many of the roads are very much in want of engines, and the managers only refrain from buying new ones because it is possible to get along a few weeks or months longer before the outlay is imperative. This is not good management, for the work is now done with worn-out machinery at increased expense, and the renewals will be delayed till the prices of locomotives begin to advance rapidly, when the orders will help to bring about another period of fancy prices. The practice followed by so many railroad managers, of permitting their machinery to go without renewal or proper maintenance during times of business depression, exercises a most injurious influence on the country's industries, for it tends to force business down in dull times, and gives trade an artificial lift when the reaction comes round. It appears to be the course for natural retribution that the roads which follow the policy indicated should have to pay fancy prices for their machinery when they get ready to buy, and the only cause for regret about that is that their pernicious policy punishes innocent parties.

There have been remarkably few locomotives built in railroad shops during the last year, and the new work done has been carried on principally to steady the fluctuations of repair work. Considerable attention has been directed to working out improvements on the locomotive. Seasons of depression in the transportation business have always exerted a stimulating effect upon the progress of locomotive improvement. The way in which most of our railroads are operated leaves very little opportunity to work out improvements in machinery when business is active, for the demands of transportation are generally beyond the capacity of the motive power, and all that is thought of is to get the trains moved. But when freight is hard to find, when rates are low and locomotives at a discount, the demand arises for reduced expenses, and attention is directed to the problem of making the locomotive do its work at less expense for fuel and repairs. In many quarters master mechanics are striving to find ways and means for taking more of the heat out of the products of combustion by imparting to the water part of the heat that usually passes into the smock-stack. Others are working on the problem of taking more work out of the steam as it passes through the cylinders, while many are still engaged working out the simplification of parts that reduces the expense of repairs.

It seems to us that those who are striving to utilize more of the heat produced by the coal are working in the line of experiment likely yield to the best results. The leading fault found with the American locomotive by its detractors has been that it evaporates too little water for the fuel consumed. The best friends of the engine can hardly say that the accusation is groundless. We have some locomotives evaporating as much water per unit of heat in the fuel as any locomotive running, but that is not the characteristic of our engines. There is serious waste of fuel going on that ought to be avoided. Various causes contribute to waste of coal by our locomotives. The first cause which ought to be susceptible of the easiest remedy is bad firing. A great deal has been said and written in the last few years about improving the methods of firing our locomotives, but the majority of firemen work on in their own wasteful way undisturbed. So long as the autocrat of the scoop is permitted to laugh the principles of combustion to scorn, the locomotive designer can not produce an engine that will make a good record in economy of fuel. Improvements in the methods of supplying air to the fire will, probably, in many engines produce more efficient combustion of the gases; but the most important and promising line to work on, after improving the character of firing, is to find the means of increasing the difference between the fire-box and smoke-box temperature. The smoke-box temperature of our locomotives averages about 200 degrees higher than it ought to do. This represents great loss of heat. The master mechanic who succeeds in reducing the

smoke-box temperature of his engines 150 or 200 degrees. while maintaining the fire-box temperature, will make his work felt on the coal-pile.

Our master mechanics who are interesting themselves in taking more work out of the steam are doing nothing in the way of compounding the locomotive. Our most advanced and enterprising railroad mechanical men have no expectation that a compound locomotive would be successful. In various ways attempts are being made to obtain more expansion of the steam by using improved valve-gear, and some of those who have applied this line of improvement to slow-working locomotives speak very encouragingly of the results. There are hundreds of locomotives working on our mountain roads that receive no benefit whatever from the expansion of steam, There ought to be no difficulty in effecting material improvements on locomotives doing work of this character. Improving the distribution of steam in a high-speed locomotive is a more difficult problem, for some of our best link-motion engines use the steam in a way that leaves little to be improved.—*National Car-Builder.*

THE RELIEF DEPARTMENT OF THE PENNSYLVANIA RAILROAD.

THE Pennsylvania Railroad Company announces the creation of a new department in its service, having for its object the establishment and management of a relief fund, for the payment of definite amounts to employés, who, under the resolutions, shall become entitled thereto, when they are disabled by accident or sickness, and, in the event of their death, to their relatives or other beneficiaries. In connection therewith, the department is to exercise supervision over sanitary matters affecting the health of employés, and put in operation measures to secure conditions favorable thereto. The fund will be created by an application to that purpose, under contracts of employment, of portions of the wages of employés, at uniform rates, graded in amount according to their regular pay. The company will be trustee for the fund and responsible therefor, pay any deficiencies which may arise from the fund not proving sufficient to meet the demands upon it, manage the department, pay the operating expenses, furnish the necessary office room, and grant the services of its officers and agents without charge upon the fund. All the railway and ferry companies in which the Pennsylvania Company has a large interest, and whose works are associated in management, have adopted similar relief projects, and entered into an agreement with the Pennsylvania for their joint supervision. This plan has been approved by the board of directors, and printed copies can be obtained by employés from the division officers. The general features of this plan are as follows:

1. The creation of a new department in the service, to be known as the Pennsylvania Railroad Relief Department, having for its object the establishment and management of a fund, to be known as the Relief Fund, for the payment of definite amounts to employés who, under the regulations, shall become entitled thereto, when they are disabled by accident or sickness, and, in the event of their death from accident or natural causes, to their relatives or other beneficiaries. In connection therewith, the department is to exercise supervision over sanitary matters affecting the health of employés, put in operation measures to secure conditions favorable thereto, and take charge of such kindred matters as may be assigned to it.

2. The fund will be created by an application to that purpose, under contracts of employment, of portions of the wages of employés, at uniform rates, graded in amount according to their regular pay. The company will be trustee for the fund and responsible therefor, pay any deficiencies which may arise from the fund not proving sufficient to meet the demands upon it, manage the department, pay the operating expenses, furnish the necessary office room, and grant the services of its officers and agents without charge upon the fund.

3. Those who shall become entitled to the benefits of the fund will be known as "Members of the Relief Fund." Their admission to its privileges will be based on applications to be made by them in the form and under the terms prescribed in the regulations of the department.

4. The department will be in charge of a superintendent, who will be aided by an advisory committee consisting of members, chosen equally by the employés who are members of the fund and by the board of directors of the company, with the general manager of the company and the superintendent of the relief department as *ex-officio* members.

5. The benefits will consist chiefly in: Payments of stated amounts to members disabled by sickness or by injuries received in the discharge of their duties; payments of stated amounts to designated relatives or other beneficiaries of deceased members; free surgical attendance for members disabled by injuries in the discharge of their duties; arrangements for fixed moderate rates, of which members may avail themselves, for medical attendance in case of ordinary sickness; medical supervision over sanitary and other matters affecting the health of members.

6. For the purpose of determining the monthly rates, members will be divided into classes, according to the amount of their regular wages per month, as follows:

1st Class—Those receiving not more than $35.
2d Class—Those receiving more than $35 and not more than $60.
3d Class—Those receiving more than $60 and not more than $80.
4th Class—Those receiving more than $80 and not more than $100.
5th Class—Those receiving more than $100.

For members not paid by the month, the classes will be determined by the usual amount of earnings per day.

As far as practicable, those in similar grades of the same kind of service will be classed together without regarding slight variations in the pay of individuals from the limits assigned for the several classes.

The rates for the first class will be 75 cents per month; for the second class, twice as much, $1.50; for the third class, three times as much, $2.25; for the fourth class, four times as much, $3.00; and for the fifth class, five times as much as for the first, $3.75.

The amounts applied by employés to the purposes of the relief fund will be deducted from their wages on the pay-rolls monthly in advance, and placed to their credit in the fund.

7. The accident benefits per day, not including Sundays, are for the first 26 weeks: First class, 50 cents; second class, $1: third class, $1.50; fourth class, $2, and fifth class, 2.50. After 26 weeks the benefits are half the above figures. The sick benefits per day, not including the first week or Sundays, and not longer than 52 weeks, are the same as for accident benefits for the first 26 weeks.

The payments in the event of death from accident are to be: First class, $500; second class, $1,000; third class, $1,500; fourth class, $2,000, and fifth class, $2,500. In cases of death from natural causes the benefits are one-half the amount given in the event of death from accident. Under specified conditions members may enter classes higher than those to which their pay assigns them and may take additional natural death benefits.

8. In order that the cost of the proposed benefits may be as small as possible, and each member derive all possible benefit from his payments to the relief fund, the number participating must be large and regular. In view of this and of the responsibility assumed by the company, it will be a condition that each person entering the service or promoted in it, after the inauguration of the department, shall become a member of the relief fund and participate in its benefits. Persons in the service at that time will, for six months thereafter, be afforded the privilege of participating without regard to age or physical condition.

9. The operations of the relief department will commence February 1st, 1886, from which date applications will be received. The payment of contributions and the title to benefits will not commence until February 15th, 1886. Applications are to be made to those under whom the applicants are employed, who will afford employés an opportunity of examining the regulations of the relief department, and will furnish blanks for applications, and any required clerical assistance in filling them up, and will forward them as may be directed. As the privilege of participation will hereafter depend upon age and physical condition, those now in the service may be debarred from participation if they delay applying until after the period during which the privilege is open to them.

10. The company having established this method of relief for its employés, and undertaken the management and expense thereof, will discontinue the allowance of gratuities after the expiration of the period of six months before mentioned, and all fines paid by employés for dereliction of duty will be added to the relief fund.

The Northern Central Railway Company, the West Jersey Railroad Company, the Philadelphia, Wilmington and Baltimore Railroad Company, the Camden and Atlantic Railroad Company, the Baltimore and

Potomac Railroad Company, the West Jersey Ferry Company, and the Camden and Philadelphia Steamboat Ferry Company, in which corporations the Pennsylvania Railroad Company is largely interested, and whose works are associated in management, have adopted similar relief projects and entered into an agreement with this company for the joint management of their several relief departments, with that of this company. For convenience of designation the joint operations of the said relief departments are to be conducted under the title of "The Pennsylvania Railroad Relief Department," all applications by employés and the agreements therein being made, however, to and with the company in whose service the applicants shall be, each company assuming obligations with regard to the same, and to their employés in connection therewith similar to those assumed, as above stated, by the Pennsylvania Railroad Company.

The following general notice in reference to the matter has been issued by General Manager Pugh:

"The regulations for the government of the department have been prepared upon large sheets to be displayed in shops, stations and other prominent places, where they may be seen by those in the service, and in book form for the use of officers and of employés who cannot be conveniently reached by the other method.

"It is desired that officers bring the regulations fully to the notice of employés, and that they supply each one with a copy of the circular of the president of the Pennsylvania Railroad Company introductory of the relief department, and a copy of the blank form of request for admission to membership in the relief fund. They will also take measures to facilitate such request and the completion of applications for membership, and otherwise carry out the object of the department and the instructions issued by the superintendent thereof.

"The privileges to which present employés are entitled as to admission to membership, without limitations as to age and physical condition, should be explained to them, and the requirements upon these points as to new employés should be carefully examined and conformed to.

"The organizations for conducting the relief department provide that the business shall be in charge of a superintendent and an assistant superintendent, and the following appointments have been made: J. A. Anderson, superintendent; Holmes D. Ely, assistant superintendent.

"The office of the department will be at Trenton, N. J., and the operations of the same will commence February 1st, 1886, from which date applications will be received. The payment of contributions and the title to benefits will not commence until February 15th, 1886.

"Communications for information in regard to the relief department, and requests for blanks, etc., can be addressed to the superintendent at Trenton, N. J., from and after this date.

"It is desirable that superintendents, having fully informed themselves, should call together their officers and others who employ men and take up the subject fully with them, making such explanations as may be necessary, to the end that all shall become thoroughly familiar with the regulations."

Inquiries About Driver-Brakes.

THE following circular of inquiry has been sent out from the office of the secretary of the American Railway Master Mechanics' Association:

The driver-brake committee requests an early reply to the following queries, viz.:

1. Are there any circumstances under which you would recommend the application of driver-brakes, and if on all classes of engines, viz.: passenger, freight and switching?

2. What are the best substances, the best shape and best size of brake-blocks to be used on steel tires?

3. Does the application of driver-brakes lessen engine mileage between each tire turning, etc.? If so, to what extent?

4. Does their application lessen mileage between repairs that can be got out of journals, axle-boxes, horn-blocks and wedges, side-rod brasses, etc.?

5. Is any injury done to engine or side-rods by applying brake-blocks on one side only, and between wheels. (wedge type) thus forcing the axles further apart, or is there is a practical advantage in gripping each wheel with brake-blocks on both sides (compression type)?

6. Is it advantageous to couple driver, tender and train-brakes, so that one handle or valve will apply the whole?

7. Which is the best position for brake-blocks so as to give the greatest power and least interference with the elastic action of the main springs?

8. What percentage of the weight of the drivers is it judicious to utilize for brake resistance in view of the train breaking loose, and the possibility of the front (by the automatic application of the brake) being brought to a stop earller than the rear portion, thus resulting in a rear pitch-in?

9. Do you recommend the application of steam or other form of power-brake on drivers when the train is not provided with any form of continuous brake—or, in other words—is there any element of danger in having a powerful brake resistance at the front end of the train?

10. As there are several ways of applying brakes through an electric current, should the electric wire be so connected with the source of power that the touching of a button or key by the train conductor, would give him the opportunity of applying the brakes on the driving and tender-wheels as well as on the car-wheels?

Do not confine your answers to the above leading questions, but in addition kindly give any experience, information, statistics or opinions you may have on the general subject of the application of driver-brakes to locomotives either for or against.

On behalf of the committee,

H. A. WHITNEY,
Inter-Colonial Railway.
J. DAVIS BARNETT,
Grand Trunk Railway.

Replies to be addressed to J. Davis Barnett, Port Hope, Ontario, Canada.

Railway Progress in China.

MR. CHARLES SEYMOUR, United States Consul at Canton China, has circulated printed copies of the memorial presented last year to the Imperial Government of China, by the late Imperial Commissioner, Tso Tsung-Tang. The pamphlet is of value as an indication of the spirit of progress in China. On the subject of railways the commissioner dwells with force. He says: "Railroads must be modeled and built. In foreign countries, trade is the backbone of the state, and China is different from them in condition and circumstances. But railroads are built by the merchants, and military movements are benefitted by the roads. Transportation is facilitated and made expeditious, and wherever the railroad extends there benefits accrue. Before the railroads were made, many hindrances were thrown in their path, but when once they came into existence, the people on that account grew rich; countries became powerful, and goods imported were multipied. That there is every advantage and no detriment is only too obvious. The comments of the masses are multifarious, but there is no necessity to argue with them and explain everything. As the Analects have it, 'The people can be made to follow, but cannot be convinced.' Take, for instance, the telegraph and steam navigation—things China never had before; yet once they are initiated they become indispensable. If railways are introduced, the benefits that will be derived are of still wider scope. The memorialist is of the opinion that the first railroad should be laid from Tungchow to Ching-kiang-fu so as to connect the pivots of the north and south. Transportation

being made easy, the trade will become brisk and military movements being rendered expeditious the army may be reduced to a great degree. Besides, the cost of the road is only several millions; if shares are purchased by mandarins and merchants to make this road as an experiment, the plan can be carried into execution. Moreover, it interferes in no respect with the country and the livelihood of the people. When this road is a success it can be extended. A railroad for the northwest is especially inevitable in the future. The memoralist proposes that as soon as the minister for the board of marine is appointed, he is to be instructed to deliberate upon the subject, to devise methods for raising funds, to draw up proposals for carrying the plan into execution, and finally to report everything to the Throne."

Railways Across the Boundary.

ANOTHER effort will be made before the Canadian Parliament to obtain charters authorizing the construction of railways crossing the United States boundary west of Lake Superior. Up to the present time the Dominion Parliament has refused to grant any charter to build any railway designed to connect American railway lines with points to the Canadian northwest, and all such charters passed by the Manitoba legislature have been disallowed. The building of such lines has been regarded as a breach of contract with the Pacific Railway Company, as one of the conditions of the agreement with that company is that no competing railway line shall be allowed to be built for twenty years from 1881. Two years ago, when the bill granting to the Pacific Company an additional loan of $30,000,000 was before parliament, Sir Charles Tupper, then minister of railways, stated that as soon as the company had its line around Lake Superior the complete monopoly clause of the contract would not be insisted upon. Last session an effort was made to obtain a charter, but a new minister of railways, Mr. Hope, held that the Pacific Company's monopoly should not be interfered with until traffic over their road had been established. At the coming session power will be asked to build a railway from the international boundary, near St. Vincent, Minn., to Portage La Prairie, Manitoba, and another company will apply for a charter for a road from Brandon to Lake-in-the-Woods. It is expected that the government will oppose granting the charters.

Requirements of an Automatic Electric Block-Signal System.

GENERAL MANAGER MCCREA, of the Pittsburgh, Cincinnati and St. Louis Railroad, gives the following as the requirements of an automatic electric block-signal system:

1. The system should be reliable beyond question, so that in case of trouble the responsibility can readily be placed.

2. The signals should indicate either "stop" or "go ahead," never cautionary, unless as a distant, indicative of a home signal in advance.

3. The signal in its "clear" position should indicate an entirely unobstructed track and should hold all conflicting signals to "danger," and lock all switches (if possible in the position to act as throw-offs) which, by being moved during the passage of a train running according to a signal, might either throw it from the track, divert it from the intended course, or allow another train moving in either direction to collide with it.

4. Semaphores should be used to govern running tracks. On roads which run to the right, the arm should point to the right of the direction in which the train is moving, and on roads which run to the left the reverse should be the case—this for the purpose that direction may be indicated. It is not in all cases possible to place the signals for the same direction on the same side of the track, consequently a disk signal, even if shielded on the back, cannot (unless by rule, or of a distinguished form, neither of which is hardly to be considered good practice) be made to indicate direction.

5. Pot signals should be made to govern sidings in order that as few signals as possible be displayed on the main running tracks, and again, that a short sight only be given, so as to compel an engineman while on any subordinate track to keep his train under complete control.

6. The current should hold the signal to "safety," so that in case of failure of the battery the signal would automatically indicate danger.

7. On a single-track the block section should so overlap that no two trains moving at speed in opposite directions should be allowed in adjoining sections to approach each other at the same time.

8. Provision should be made to indicate the position of all signals in adjacent block-sections to the train-order or telegraph office.

9. Atmospheric disturbances should be provided for so that in no case could an electric charge hold a signal at "safety."

Railway Accidents in Russia.

As is well known to readers of Russian works of travel, says *Engineering*, Russian railway traffic is worked with such slowness and care that accidents are less frequent than on the busier and quicker lines of western Europe. During the last few weeks a report has been issued by the minister of railways detailing the accidents that have occurred from 1880 up to the end of 1884. In 1880 the total was 434 killed and 675 wounded, which included 23 passengers killed and 68 wounded, 235 railway employés killed and 474 wounded, and "outsiders," 176 killed and 133 wounded; the latter category comprising persons killed or injured in traversing the lines at level crossings, etc. In 1881 the figures were: 24 passengers killed and 102 wounded, 198 employés killed and 459 wounded, and outsiders, 158 killed and 157 wounded; the total being 380 killed and 718 wounded. In the following year, 1882, occurred the famous landslip on the Moscow-Koursk Railway, when, owing to heavy rains and the smallness of the culvert, a huge embankment collapsed and buried a train which happened to be passing over it at the time. Hence the mortality among passengers was abnormally high, the total being 64 killed and 124 wounded. Among the employés the fatalities were 214 killed and 427 wounded, and among outsiders 170 killed and 166 wounded; the total being 448 killed and 717 wounded. In 1883, 23 passengers were killed and 78 wounded, 211

employés killed and 456 wounded, and 204 outsiders killed and 183 wounded; the total being 439 killed and 717 wounded. In 1884 the figures were: 25 passengers killed and 85 wounded, 170 employés killed and 387 wounded, and 223 outsiders killed and 182 wounded; the total being 420 killed and 654 wounded. From the above figures it will be seen that the annual average of the accidents on the 14,000 miles of Russian railways is about 420 killed and 700 woudded. Immense pains are taken by the ministry of railways to keep the list as low as possible, and in every case a searching investigation is instituted, and carelessness or negligence heavily punished.

Car-Axle Tests on the Pennsylvania.

THE Pennsylvania Railroad specifications for axles (adopted March 2nd, 1883) require that one extra axle be furnished with every hundred, for tests; the journals swagged, and axles centred. Passenger axles must be of steel, and rough turned throughout. Two test pieces are cut from an axle, ⅝ inch diameter and 2 inches long, which may be taken from any part of the axle provided the center line of the test section is 1 inch from center line of axle. It is required to show a tensile strength of 80,000 pounds per square inch; and an elongation of 20 per cent. If less than 75,000 pounds, or elongation below 15 per cent., or fractures irregular, the axles are not accepted. Steel freight-car axles must stand without fractures five blows at 20 feet of a 1,640-pound weight striking midway between supports 3 feet apart; axle turned over after each blow. Iron freight axles are to be hammered, and the iron must be double-rolled from muck-bar not exceeding ¾ inch thick; tough, fibrous, uniform, and free from scrap. Axle must stand without fracture three blows at 10 feet and two blows at 15 feet from same hammer and support as above.

Automatic Freight-Car Brake Tests.

THE following circular has been issued by the committee appointed by the Master Car-Builders' Association on the subject of freight-car brakes:

At a meeting of the committee of the Master-Car Builders' Association on freight-car brakes, held at Harrisburg, January 6th, 1886, it was decided to abandon the tests originally proposed, and in lieu to invite the manufacturers of freight-car brakes to competitive tests to be held at Burlington, Iowa, July 13th, 1886, and April, 1887, under the following conditions:

1. Each brake company will furnish, fitted with its brake, fifty 30-foot or 34-foot box-cars of 40,000 pounds capacity; 34-foot cars being preferred. Each car to be equipped with brakes on both trucks, and plain cast iron shoes. The cars to be delivered to the committee free of charge at some point on the Chicago, Burlington and Quincy Railroad on or before July 7th, 1886.

2. The first test will take place at Burlington, Iowa, on the Chicago, Burlington and Quincy Railroad on July 13th, 1886. After this trial, the cars will be returned to the owners at the point of delivery, and put into general service.

3. An endurance test under the supervision of the roads owning the cars will then take place. A careful record of the cost of all repairs to brakes will be kept except as regards the foundation brake (beams, shoes, blocks, hangers and brake-levers.) The mileage of cars while undergoing this endurance test will be kept as far as practicable, and all brakes are to be kept in constant use until the second test in April, 1887.

4. In April, 1887, the cars will be returned to Burlington, and without being prepared for trial the July tests will be repeated.

5. Two similar eight-wheel freight-engines will be employed in the Burlington tests. These engines have 17 by 24-inch cylinders and not less than 51,000 pounds on the drivers, one engine to be equipped with the Westinghouse driver-brake and the other with the Eames vacuum driver-brake. Both tender-trucks to be fitted with brakes, plain wrought iron shoes to be used on engines; each brake company to have the option of selecting either of these engines for use in the trial of their brake.

6. The Chicago, Burlington and Quincy Railroad will not be held responsible for mileage of cars while on its lines, nor for any damage to the cars that may occur through the inefficiency of the brake.

7. Three or more competitors will be required before the tests will be entered into. Any competitor desiring to enter the tests should communicate with the chairmain on or before April 1st, recommending any features of device that should be brought out during the trials. The committee, prior to May 1st, will hold a meeting to formulate the rules governing the tests, of which each competitor who has signified his intention of entering the tests will be apprised. Competitors will be required to submit to all tests that are decided upon by the committee. The committee are not in a position to provide equipment for these tests, but regard the subject as of great interest to railroad companies, and trust they will contribute to its success by furnishing cars to the competing brake companies, and afford them any other reasonable facilities.

G. W. RHODES,
W. T. HILDRUP,
JOHN S. LENTZ,
Committee.

The Nuisance of Whistling.

WITH regard to the whistling of locomotives at crossings the report of the Massachusetts Railroad Commission, just issued, says: "Four petitions have been acted on, and whistling has been forbidden at the several crossings covered by these petitions. The board believes that this legislation is wise. They agree with their predecessors in holding that the value of the whistle as a danger-signal is impaired by its constant use as a mere crossing-signal; that such use inflicts a heavy penalty upon the innocent to protect the reckless and undeserving, and that at many crossings the whistle is simply a useless annoyance. It is not improbable that fatal accidents will occur at some of the crossings where whistling is now dispensed with. Indeed, it is certain that at some time they will occur, for such fatalities have happened, from time to time, when whistling was permitted; and its cessation will not relieve careless people from danger. But such accidents will not disprove the wisdom of the law. If the natural horror arising from the occurence of a fatal casualty should ever lead to a condemnation of the statute and to a demand for its repeal, it should be remembered that the benefits of the law are constant, although they are not visible; that no law can always shield men from the results of their own recklessness, and that a highway crossing accident is almost impossible under any state of law, if travelers will use ordinary care."

Report of the New York Railroad Commissioners for 1885.

THE third annual report of the Board of Railroad Commissioners of the State of New York for the fiscal year ending September 30th, 1885, is a large and complete octavo volume of 641 pages. Apart from the usual statistical matter which is found in such reports, and which on this occasion is full and accurate, the report is furnished with a valuable appendix containing the general railroad law, and a classification of all law relating to the railways of the state. The report shows that an enormous business was done on the railways of the state notwithstanding the unprofitable rates, the gross earnings being $111,632,961.47, as against $120,227,871.72 the year before. The operating expenses were about $6,000,000 less than in 1884. There was a great diminution in the number of accidents, there being only 13 passengers killed and 90

injured. In 1884 there were 25 killed and in 1883, 40. One hundred and thirty-seven employés were killed and 771 injured, while 261 other persons suffered accidental deaths. The report says: "Probably for the first time since railways have been run within the state of New York can it be said that a year has elapsed without a single passenger being killed from causes beyond his own control. Such was the fact for the fiscal year ending September 30th, 1885." The physical condition of the railways has greatly improved within the last two years. The following is an outline of the report, showing a few of the grand totals:

	1884.	1885.
Gross earnings	$11,632,961	$120,227,871
Operating expenses	77,125,826	83,240,858
Net earnings	34,457,135	36,987,013
Income other sources	6,244,808	6,237,025
Interest*	24,644,451	26,817,711
Taxes	4,874,334	4,640,323
Dividends*	10,455,865	17,946,259
Deficit	3,502,337	10,471,322
Stock and debt	1,292,395,622	1,271,380,638
Cost roads and equipment	1,175,948,966	1,163,905,127
Percentage gross income to cost	3.46	3.70
Percentage net income to cost	1.09	1.18
Percentage dividends to stock	1.60	2.76
Miles of road built	7,311.40	7,317.04
Tons of freight carried one mile. Increase in 1885 of 6.18 per cent.	9,902,683,295	9,326,068,865
Average freight earnings per ton per mile (cents)	0.73	0.83
Average passenger earnings per passenger mile (cents)	2.16	2.42

*Includes, respectively, interest and dividends paid by lessors from rentals received from lessees, as follows: Interest, 1885, $5,031,909; 1884, $3,827,045. Dividends, 1885, $3,427,453; 1884, $3,308,472.

An Anecdote of General McClellan's Railway Days.

IT is said that soon after taking charge of the Ohio and Mississippi road General McClellan issued an order whereby a passenger without a ticket or fare was to be backed up to the station from where he came and put off there. This was in accordance with a West Point sense of justice, however impracticable from a railway standpoint. One day a passenger who claimed to have gotten on at East St. Louis was not discovered until the train was whirling for Vincennes. "Little Mac" happened to be aboard, and the facts were reported to him by the conductor. The situation was awkward, but he was equal to the emergency. Drawing out his watch he said: "The southbound express is due in an hour-and-a-half. Never mind backing down—I'll give him a pass back to East St. Louis."

Poppies for Railway Road-Beds.

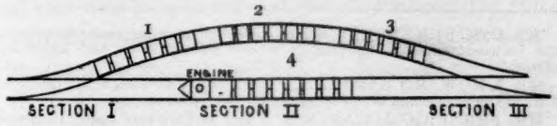
THE chief roadmaster to the French Government railways has made the interesting discovery that the best plant yet discovered for consolidating the loose soil of a newly made embankment by the interlacing of its roots is the double poppy. The ordinary grasses or clovers employed for the purpose required, he says, several months for the development of their comparatively feeble roots, while the double poppy germinates in a few days, and at the end of three or months its roots are a foot long and tightly interlaced. The plant is an annual, but it sows itself after the first year. In France it is among the hardiest of the common plants.

The Proposed Ship Canal Across Ireland.

THE proposed ship canal across Ireland would be 127 miles in length, and would contain thirty locks. For ships of 1,500 tons the cost would be $40,000,000; for ships of 2,000 tons, $60,000,000, and for ships of 5,000 tons and upwards, $100,000,000. If built on this scale the canal would be 200 feet wide on the surface and 100 feet at the bottom. The passage through the canal would be effected by a system of towage, and it is estimated that the passage of a ship from Galway Bay to Kingstown would occupy between twenty-four and thirty-six hours.

Another Problem in Switching and Car-Drilling.

ANOTHER problem in switching and drilling cars is here given the readers of the JOURNAL for solution. Like the one published in the December number this problem was presented in actual practice on one of the leading roads of the country and was solved at the time.



The siding is entirely occupied by three trains, each containing a number of cars, which trains are numbered 1, 2 and 3. The locomotive is standing on section II of the track with a train of a number of cars, which train is numbered 4. The locomotive can move but one train at a time.

Problem: To transpose trains 2 and 4, leaving trains 1 and 3 in their original positions, and without making flying switches.

RAILWAY servants seem to have a better chance in New South Wales than in England, says an English exchange. There the railways are in the hands of the government, and there exists a regular system of promotion from the lower ranks, which often prevents new comers readily obtaining employment, unless possessing exceptional qualifications, the humblest servant having a chance of rising by steadiness and ability to the leading positions in his department.

THE cost to the State of New Jersey of defending the railway tax suits has just been made public by the Attorney General as follows: Counsel fees, $18,439.83; engineer and expert testimony, $15,138.91; printing returns to writs, testimony, briefs, etc., $5,196.60; fees to masters, courts, stenographers and other expenses of taking testimony, $4,403.27; total, $43,178.61.

IT is stated that a prominent business house at Metamoras, Mexico, has received notice from their London correspondent that the Mexican National Construction Company has borrowed money from Matthiesen & Co., of London, to continue the construction of that road, and that work will be resumed inside of three months.

THE heaviest locomotive of which there is any record is a passenger tank-engine of the Pennsylvania Railroad. Its weight is stated to be 120,000 pounds, but the driving-wheel is only 60 inches in diameter. The fast express engines on the same road have driving-wheels 78 inches in diameter.

ONE-FIFTH of all the coal produced in the United States is found in four counties, of which Pittsburgh is the business center. Nearly one-third of the product is converted into coke. There are 100 coke-makers, 12,000 ovens, and $13,000,000 invested. Six thousand men are employed.

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RAILWAY RELIEF ASSOCIATIONS.

ELSEWHERE in our columns is given a full description of the newly-created relief department of the Pennsylvania Railroad, which has been in operation since the first of this month. A perusal of the various regulations and provisions will show that the management of the road has devoted careful study to the subject and has honestly endeavored to provide a satisfactory system for the relief of the employés of the road in cast of disability or sickness, and for relief to their families in case of death. The system is intended to reach 40,000 employés, and with their families nearly 200,000 persons will be benefited by the regulations of the relief department. With the general operation of the system no fault can be found. It is wisely conceived and equitable treatment is assured every beneficiary. The small payments which the members are to make for the maintenance of the department have been classified in such manner that the benefits of the system are within the reach of all, and it is not to be questioned that the finances of the department will be admirably and irreproachably managed. In every detail there is the sign of careful forethought and deliberation.

And yet the employés do not appear to enter with unanimous zeal into the spirit of the undertaking. Considerable complaint is made that the road is forcing its employés into a system of mutual benefit which does not appeal to them as the best that could be devised. It is stated that the employés themselves are and have been contributors to a beneficiary fund of their own and that the labors of the management is a work of supererogation. Judging by the utterances of a number of the Pennsylvania's employés publicly made in the daily papers, the management of the road has not received thanks for its efforts in behalf of its subordinates—efforts that certainly were entirely unselfish.

Perhaps for this state of affairs the much-vaunted American trait of independence is in great part responsible. The average railway employé in an intelligent man and a member of that proud class known as skilled labor. In no other class of persons is to be found a greater willingness to assist unfortunate bretheren or a more unselfish generosity. Mutual benefit associations flourish among this class to a marvelous extent and are blessed with a prosperity that is envied by strictly business organizations designed to effect similar results. There is an *esprit de corps* among the railway employés which is rigidly and proudly maintained. But the railway employés desire to control the associations and relief departments themselves. They wish to feel that they alone are responsible for the proper workings of the organizations and that they alone are benefiting their unfortunate coworkers. Any supervision on the part of the management of a road is thought to be an unwarrantable intrusion, and

the relief accorded under these circumstances is felt to partake of an eleemosynary character.

Independence is a noble trait, but like many other very noble traits it is liable to work mischief if unrestrained. No man who works for wage is independent, from the President of the United States down to the humblest laborer. He is answerable to somebody and is responsible for the proper performance of his duties. The pride of the employés in being their own financial managers is a foolish pride. It can hardly be expected that they can as skillfully control the receipt and disbursement of large sums of money, in the aggregate, as men who by training and experience are expressly fitted for such duties. Nor do we believe that they would themselves lay claim to equal capacity for such duties. But they love the feeling of independence, and the prosperity of their relief asssociations are matters of personal pride to their managers. Under the circumstances we are not surprised that the organization of the Pennslyvania's relief department has been rather cooly received by its intended beneficiaries, and simply for the reason that the employés were not consulted. Had the management of the road sought a conference with its employés, submitted its present plan of relief and requested their coöperation, it would doubtless have been accorded; but this omission has aroused a feeling of antipathy to the proposed system.

It is highly probable that ultimately all opposition to the Pennsylvania's relief department will vanish, and that it will result in incalulable benefit to the employés of that vast railway system controlled by the corporation; but other roads may learn a little lesson from the discontent which the official circular of the management has aroused. In aiding employés the surest way to gain appreciation is to secure coöperation, and to obtain the latter the impression should be conveyed that the aid is self-given. Nine times out of ten the employés of a road would willingly adopt any fair system of mutual relief that the management might submit; but they desire to be consulted, and to that extent they are perhaps justifiable. In so doing the management would minister to the pride of its subordinates, it is true, but a proper pride—the pride of manly self-reliance.

"HERE'S A STATE OF THINGS!"

THE New Jersey legislature has adopted a resolution denying the right of the United States to give permission for the building of a bridge across Staten Island sound, or rather claiming that the permission of congress alone is not sufficient, the sovereign state of New Jersey having the final say in the matter. In fact, to judge by some of the printed utterances of the New Jersey legislators, there will sooner be war and secession than a surrender of the statal rights. But all the same the conviction is dawning that the bridge will ultimately be built. In all probability the original locality selected will be abandoned and the bridge constructed at a point where it will less interfere with navigation; but it is doubtful if the project will be defeated even with the powerful opposition now arrayed against it. And thereafter Jerseymen will continue to curse forever and forever the memory of those sweetly innocent commissioners who ceded Staten Island to New York when by every law of geography and common-sense it clearly belonged to New Jersey. And to add to the complexities of New Jersey legislation the supreme court of that state has just decided that the Railroad Tax Bill of 1884 is unconstitutional, and the state is thus left without money in its treasury and with the necessity of refunding the large sums collected from the railways during the past vear. Truly poor Jersey is beset with difficulties.

RAILWAY CONSTRUCTION IN THE SOUTH.

AMID the general depression which has characterized railway construction in this country for the past two years, it is encouraging to note that in the south railway enterprise has steadily been developing. During the year just passed, 727 miles of new road were constructed in the southern states, or one-fourth of the total yearly construction of the country. In the past five years there has been an increase of railway construction in the south of 9,323 miles, a favorable comparison with any of the great sections of the country, and this enterprise has been carried through by a hitherto stagnant division of the nation. The new construction in Virginia during these five years has been nearly 800 miles, a construction exceeded during the same period in two states only—Texas and Arkansas. In relation to increase of population undoubtedly the southern states have taken the lead in railway construction; and this is as it should be. For twenty years enterprise of all kind has lain dormant in the south, and southern railways have been the synonym for lack of progress, discomfort and general inanition. It is evident that the old south has at last awakened and that its great resources are to be vigorously utilized.

And it is in the south that railway construction can safely be pushed and encouraged. There it can be developed without fear of undue competition, paralleling, and consequent bankruptcy. Under the new conditions that have arisen since the war, the south is a vastly different section of country from what it was in ante-bellum days. The planter has given place to the manufacturer; northern capital is seeking investment in southern industries, and northern enterprise has demanded greater facilities for transportation. Awakened from the apathy which seized him upon the surrender of Lee and the utter anni-

hilation of the hopes of the Confederacy, the southerner has again taken up his citizenship in the United States, and is seeking in the only sensible way to regain what he lost in the unhappy struggle. The abolition of slavery has, too, introduced the feature of competition in southern labor, and practically the south is a new and undeveloped land. Its resources are great. There is scarcely an industry that cannot be introduced under auspices that will insure its success, and the true mettle of the southerner is rapidly asserting itself. Under all these circumstances there is a loud and imperative demand for railway construction in that fertile section of the country, and the call is being heeded. Of course the matter can be overdone, but there is a vast amount of new construction yet to be accomplished in the south before there is a glut of railway facilities—which unfortunately is not the case in the north—and the eye of the railway capitalist and investor is turned to that long abandoned section as the likeliest field for profitable investment.

EDITORIAL NOTES.

CERTAINLY a recent spectacle in the assembly chamber at Albany was not creditable to legislative honor. Upon an announcement from the clerk, our worthy assemblymen flocked like sheep to the fore and received passes from certain railways of the state. The legislative pass is a stumbling-block in the way of honest legislation and we incline to the belief that the best plan is that pursued in New Jersey. There, certain state officials and members of the legislature are entitled to passes as a matter of right, and in receiving them they are under no obligations to the corporations. And yet with all this it is sometimes hinted that the railways have occasionally influenced legislation in New Jersey.

* * *

DURING the past year, forty-four railway companies in this country passed into the control of the courts. A mileage was here represented of 8,386, debts of $198,000,000, and a capital stock of $187,000,000. This is not a very cheerful record, and its cheerfulness is not enhanced by the fact that the vast interests of these roads are to be controlled by receivers. The railway receiver is not in very good flavor at present, and as an institution he is not popular.

* * *

FROM statistics gathered by Mr. EDWARD ATKINSON, it is shown that the railway property of the United States comprises one-fifth of the accumulated capital of the country, that it gives employment to 650,000 people, and that it annually moves 400,000,000 tons of freight, one-half of which is fuel and food. It is further shown that so cheaply is this freight transported that the Massachusetts mechanic can procure the transportation of one year's supply of food from a distance of 1,000 miles for a single day's wages. After weighing these cold facts carefully, and gathering their full import, no one can wish for a return of the "good old days" when the sound of the locomotive whistle was not heard in the land.

THE February *Century*, the "midwinter number," continues its war series in three interesting illustrated articles: "Preparing for the Wilderness Campaign," from the personal memoirs of General Grant; "Our March Against Pope," by General Longstreet, and "With Jackson's Foot-Cavalry at the Second Manassas," by Allen G. Redwood. In addition there are a number of valuable memoranda of the civil war by prominent officers. Henry Eckford contributes a paper on Antoine Louis Barye, beautifully illustrated, and Mrs. Schuyler Van Rensselaer, the fifth of the illustrated series on "Recent Architecture in America," the subject being "City Dwellings." Among the open letters of this issue is an interesting correspondence from a number of leading authors on the subject of "International Copyright." Altogether the "midwinter number" is an exceptionally strong one.

"CHESTS and Cabinets," by J. Hungerford Pollen; "An Atelier des Dames," by E. Œ. Somerville, and "Art in Persia," by William Holmden, are among the illustrated articles in Cassell's *Magazine of Art* for March. The number is an exceedingly interesting one. *The Quiver* and the *Family Magazine*, issued by the same house, are also excellent numbers. Messrs. Cassell & Co. have recently inaugurated a cheap library of standard works known as the *National Library*, and edited by Prof. Henry Morley. The first of the series, "My Ten Years' Imprisonment," by Silvio Pellico, translated from the Italian by Thomas Roscoe, has been issued and is sold for ten cents.

THE first number of *Outing* since its removal to New York is an excellent one and contains a number of interesting contributions and spirited illustrations. Commencing with the March number, Mr. Theodore Roosevelt, the well-known ex-assemblyman of this city, will contribute a series of articles on "Big Game Shooting in the Rockies," which will be fully illustrated. With the March issue Mr. Poultney Bigelow assumes editorial charge of the publication.

Railway Life, a weekly journal devoted to Canadian railway interests, has appeared in Toronto, Ont., and the railway press of this country can well afford to welcome a contemporary across the border. The first issue is an excellent one, and its success should be assured. The subscription price is $2 per year.

THE eighth annual report of the Board of Commissioners of the State of Iowa is received and shows that they have been painstaking in collecting their information, which is contained in a volumne of 608 pages. A brief outline of the report was published in the January JOURNAL.

THE printed report of the nineteenth annual convention of the Master Car-Builders' Association, at Old Point Comfort, Va., June 9th–12th last, has been received.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.

Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.

Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

STREET-RAILWAY FRANCHISES.

THE bestowal of franchises for the operation of street-railways through the streets of a city is a subject which is attracting considerable attention. Ordinarily there are three ways in which franchises are granted, and two of them are open to objections. There is the franchise granted in consideration of a definite payment in cash to the municipality; another granted in consideration of an annual payment of a certain per cent. of the earnings, and still another where the grantees of the franchise assure a definite percentage of the earnings in addition to a definite sum paid upon the receipt of the franchise. Possibly none of these methods are wholly without objection, but at present public opinion seems to to indicate that the second method is the best. And we take the liberty of differing from public opinion. It is an easy thing to assure a percentage of the earnings to the city, and any irresponsible parties can rush into a street-railway speculation when the only prerequisite is an assurance of a payment of a certain portion of their receipts. When it comes to the absolute payment of a definite sum into the city's treasury there is likely to be greater deliberation, and the enterprise will not be undertaken except with the determination to operate the road as energetically as possible. Of course in the payment of this sum there is the probability that the city will bestow the franchise for less than it is worth, and, therefore, the third method offers a safeguard to avert this probable underselling. The cash payment is a guarantee of good faith, and the payment in addition of a certain percentage of the earnings is the city's profits. Decidedly we should say that the latter method was the most desirable of the three.

In the manner of sale of franchises there is also a strong feeling that they should be put up at public auction and sold to the highest bidder, which seems right enough on its face; but in so doing the city should reserve the right to reject any or all bids if it is deemed best in the interest of the public so to do. The purchasers of a street-railway franchise should be persons whose names inspire confidence that the road will be well managed, and a definite period should be fixed within which the road should be put in operation. By this means mere speculators would be discouraged and the "freezing out" of a legitimate bidder rendered impossible. It is of the highest importance to a city that its street-railways shall be well managed, for poorly managed and equipped roads are a detriment to municipal prosperity. A guarantee of good management cannot be assured by a long purse alone, and the unrestricted sale of a franchise to the highest bidder, irrespective of the latter's standing and responsibility, is not likely to prove productive of the best results.

GRADUALLY the mystery surrounding the granting of the franchise of the Broadway surface road is being unravelled, and there is reason to believe that the committee on railroads of the New York senate, which has the investigation of the matter in charge, is composed of very different timber from the famous GIBBS committee with its great cry and little wool. As we said before, the fullest light thrown on this deep subject is highly desirable both on grounds of public honor and in the interesfs of street-railways. Putting aside the question of morality which enters into the subject, in the end street-railways would find it far more costly to secure franchises through bribery than by legitimate and above-board means.

DANGERS OF THE CABLE SYSTEM.

BY W. W. HANSCOM, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT seems proper that in the operation of any system of transit for people, a knowledge of the dangers pertaining to that system should be known and intelligently discussed in order that, if possible, they may be eliminated. If this is not entirely practicable such means should be provided as will lessen the dangers to the greatest possible extent, and the public be informed so that it may not contribute to any injury which might occur. The corporations which operate such a system should also give to the travelers such information as will enable them to exercise prudence when either riding or passing in the vicinity of trains either stationary or in motion.

This article is called forth by an item in the *American Machinist*, of November 21st, 1885, referring to an accident which occurred in Philadelphia on the cable road in that city. It is stated that "one of the grips became entangled, the grip-man was unable to release it, and the result was that the motor to which it was attached came in collision with a transfer-car drawn by horses which passes over a part of the cable road between Fortieth and and Forty-first streets on Market, and seriously injured four persons, killing two horses attached to the transfer-car, and damaging a number of motor-cars as well as the transfer-car."

From the experience which the cable road companies

in San Francisco have had, it seems probable that the immediate cause of the entanglement of the cable with the grip, was an uneveness in the cable, due to a part of one of the strands of the cable being loosened and the end of the strand, being gradually drawn out, projecting sufficiently so that it would not pass through the jaws of the grip when the car was standing still and the cable was moving; the result being that as the projecting end of the strand struck the grip, refusing to pass through the grip, it would be held while the rest of the strands would pass, and this strand would be stripped along the cable forming a bunch of coils around the rest of the cable until the resistance would be sufficient to start the car and keep it moving with the speed of the cable until notice could be given at the engine-house and the cable be stopped; or, as was the case, persons were seriously injured and much damage done before the cable could break away from the grip and with its accumulated bunch of "strand" pass into the engine-house where it would be seen and stopped. It may be easily shown how the bunch is formed by taking a piece of twine and loosening one strand and pushing this strand along the rest, as is sometimes done in trying to separate one strand.

In the operation of cable roads the danger lies in the fact that, as the cable is always moving while the cars are on the street, and also while they are stopped for the taking up or letting down of passengers, many people would naturally cross in front of a stationary car supposing entire safety in so doing, while those driving teams under the same idea would, when the car is moving—kowing the ease with which the car can be stopped ordinarily—not hurry in getting off track when going in front and in the same direction as the car.

While this condition of affairs is fraught with much danger to the public, it can so easily be avoided that its occurrence would be exceedingly rare except under extraordinary circumstances over which the cable road company might be excused from having control.

In the manufacture of the cables for roads they are made of such a length that only one splice in the length of each cable entering the engine-room is required. The splice usually requires a length of from one hundred to one hundred and twenty feet, and the ends of the strands are not all of the same length; thus one strand being one hundred feet long, the next would be eight or ten feet shorter and so on, the object being to make the diameter of the cable at the splice uniform with the rest of the cable. For a few feet where the ends of the strands come, the hemp-core of the cable is taken out and the strand tucked in its place, so that the surrounding strand protects the end of the strand which has been tucked into the center from abrasion by the jaws of the grip as the cable passes through it. Sometimes in making this splice the end is not properly tucked, and in time the end of the strand works out from the center through the other strands surrounding it, and gradually projects above the others until it cannot pass through the grip, and it is caught, resulting in more or less injury and damage to persons and property.

When cables were first used for street-roads in San Francisco, such experiences were had (fortunately without injury to persons) of the "stranding" of cables until continued use and increasing knowledge indicated that the life of a cable for safety could be exhausted without any stranding. At first the constant attention which seemed necessary was onerous, but the habit became almost a second nature, and now and for years past constant familiarity with and care of cables have educated so many that the slightest unusual appearance of the cable is instantly noted and attended to without any apparent forethought, and now no stranding can occur without criminal negligence.

In the early days of cable roads ideas of economy induced the use of cables where appearances indicated that they were liable to give out or "strand" at any time, but now these ideas have been banished and the life of the cables are limited to a known condition of safety from such accidents as lately occurred in Philadelphia.

When cable roads are properly constructed and are efficiently supervised, the accidents and injury to travelers and others are, it is believed, less than by any other means in use for transit.

DISEASES COMMON TO CAR-HORSES AND THEIR TREATMENT.

[Report of the Special Committee read at the recent Convention of the American Street-Railway Association.]

RECOGNIZING the fact that an essay upon the important subject assigned your committee should emanate from one versed in the treatment of equine diseases, and desiring to present a report worthy your careful consideration, we, at an early date after receiving notice of our appointment, arranged with Dr. W. H. Arrowsmith, of Jersey City, a graduate of the American Veterinary College, of New York, to prepare an article on "Diseases Common to Car-Horses and Their Treatment." To treat of all diseases common to car-horses would occupy too much of the time of the association; we have, therefore, restricted this article to glanders, pneumonia, colics and cerebro-spinal meningitis.

The paper as prepared we have carefully revised and now submit for your consideration.

C. B. THURSTON,
JAMES K. LAKE, } *Committe.*

SOME OF THE DISEASES INCIDENT TO CAR-HORSES.

It will not be the object of this essay to consider all the diseases that are to be met with in surface railroad stables, but to review some of the most frequent and fatal diseases, to explain their causes, symptoms, pathology, and most rational treatment; to advise in regard to their contagiousness, their diagnosis, and what prophylactic measures may be used to prevent, and what methods may be employed to impede their progress.

We will first consider the disease known as

GLANDERS, OR FARCY,

a disease which is not only fatal to horses, but also fatal and innoculable to man and other animals.

Glanders is a purely infectio-contagious disease, due to a specific germ or virus, the local manifestations of which are peculiar cancers or ulcers on the mucous membrane of the nose, with a viscid purulent discharge, ulceration of the mucous membrane, of the sinuses of the head larynx and traches, tubercles and ulcers in the lungs,

suppurating ulcers upon the skin and within the connective tissues, and which are known *farcy buds*, and enlargement and induration of the lymphatic vessels and glands of the body.

Glanders was known and described as early as the fourth century, A. D., and again in the sixteenth century; it was described by writers on veterinary subjects to be the cause of syphilis in man from the fact that glanders appeared among the horses at the same time, and caused as much havoc as did syphilis among the soldiers at the famous siege of Naples.

But among all the early writers none were familiar with the true pathology of the disease. Some looked to the head, the lungs, and the stomach as its seat; others asserted that it did not extend beyond the pituitary membrane of the nose; and it was not till the latter part of the seventeenth century that the contagiousness of the disease began to be questioned. In the early part of this century, although the contagiousness of the disease was acknowledged, still the opinion was held that it appeared only among those horses that were poorly fed and watered; that were required to undergo severe exertions upon insufficient food, and that were stabled in buildings that were poorly ventilated and drained, and where all care to hygiene had been neglected; and it was not till 1868, that it was without doubt proven by Gerlach to be of a strictly infectious and contagious nature.

Glanders is due to a virus or germ which is both transmissible and fixed. This specific infecting germ or virus exists in the various secretions and fluids of the body, and which when taken into a healthy organism will produce glanders.

Certain discharges and secretions from the affected animal apparently contain the virus in a more virulent form, thus: The virus from the nasal or the discharge from any cancer or *farcy bud* on the body, when taken into the system of a healthy animal seems to act with greater potency than does that from the blood, urine, perspiration or excreta; still innoculations from any of the secretions will produce glanders.

Glanders cannot be produced spontaneously; nor are there any influences, bad hygiene, overwork, improper feeding, or any other cause capable of producing the disease apart from the infecting virus, although the above conditions are predisposing. It is a purely infectious and contagious disease; were it so that the disease could be produced apart from its peculiar specific contagion, more than half the horses in our railroad stables, and all the horses among the poorer class of horse-owners, would be affected with the disease. Glanders is transmissible to man, and to all domesticated animals except cattle.

Both practical and experimental experience sufficiently proves that the virus of glanders is a transmissable and fixed principle. Whatever material, be it harness, cribs, bedding, or some stable utensil, that become polluted with the discharge from the nasal cavities or secretions from the cutaneous ulcers, will retain the dangerous properties for a long time, and will act as a source of contagion. Again experiments have fully proven that the perspiration or the expired air from the lungs of an affected horse will readily produce the disease.

Not every animal exposed to the infecting virus contracts the disease. Out of 138 horses that were caused to stand among diseased ones, using the same utensils and working in the same harness, only 29 became affected.

Glanders may be described as *acute* and *chronic* according to its duration; and, according to its seat of local manifestation, as *nasal*, *pulmonary* and *cutaneous*, or commonly known as *farcy*. Glanders, as in other infectious diseases, has a period of incubation which may exist from five days to as many months, and in the chronic form there is a period of apparent latentcy which may exist for months or even years.

The symptoms of acute glanders are ushered in by a chill and more or less fever, accelerated pulse and anorexia; there will be present a hyperæmia and tumefaction of the mucous membrane of the nasal cavity and at times a slight epistaxis. On the third or fourth day small nodules appear, and a diffuse, yellowish infiltration takes place in the mucous membrane of the nose, with a slight discharge which at first is thin, viscid and contains but few cellular elements, but in a day or so it becomes thicker, more viscid and of a peculiar yellowish green color, and adheres more or less to the lips of the nostrils.

The nodules soon break down and resemble small round ulcers, with swollen and ragged edges; these extend by the formation of other nodules and frequently coalesce, and give rise to an extensive ulcerated surface, with an uneven and irregular edge; these ulcers may often be seen upon the median septum of the nose by raising the alæ of the nostrils with the thumb, and looking upward into the nostrils. The discharge is often limited to one side, particularly the left, for which we offer no explanation.

The sub-maxillary glands become swollen and indurated and attached to the maxillary bone, the respiration becomes labored, the temperature increased, the appetite entirely gone, the legs, sheath and sub-abdominal region become swollen and infiltrated, the characteristic farcy buds appear on the different parts of the body, especially on the inside of the hind limbs; the lymphatics of the entire body become indurated, and with the progress of the disease the discharge from the nose becomes more profuse, diarrhœa frequently sets in and if the animal is not destroyed it dies a miserable death in from eight to fifteen days from the time of its first appearauce. These symptons of acute glanders may follow directly on infection or innoculation, but is most frequently the conclusion of the *chronic form* of glanders.

CHRONIC GLANDERS,

or, as it is sometimes designated, *pulmonary glanders*, may exist for months and even years without any outward signs which could at once be considered as pathagnomonic.

In this form of glanders there is a dry, wheezing cough, with retarded respiration, emaciated condition of the animal's body, hair staring, appetite variable, and the temperature and pulse may be slightly or not at all increased. There may or may not be a discharge from the nostrils; the glands of one or either side intermaxillary space may be nodulated. The ulcers may be wanting in the nostrils and in some cases ulcers are never found, the visible mucous membrane are pale in color and there are occasional attacks of diabetes and diarrhœa.

In other cases of *chronic* glanders, there is the same

unthrifty condition of the animal's body, there is a tendency to shiver on the slightest cold; there is a discharge from one or both nostrils, at times tinged with blood, and upon the mucous membrane of the nasal cavity may be seen small pit-like ulcers. These ulcers are very characteristic; they are excavations of varying size, from that of a three-cent piece to that of a dollar, with irregular and ragged edges. They are developed from small elevations or cells, which lie beneath the mucous membrane of the septum nasi, and present to the touch the feeling of a mustard seed beneath the skin. From each of these small elevations a minute yellowish central point is developed, with a small transparent ring about it, and beyond that red inflamed tissue; these central points or neoplastic growths soon break down and discharge their contents, the mucous membrane between them sloughs away and there is left the ragged ulcerous sores, their edges presenting the appearance of a membrane everted, with the tissue in the center granulating, and discharging an ichorous, viscid fluid with an offensive odor. These ulcers frequently continue to undergo a destructive metamorphosis and will in some cases penetrate the septum and form a ragged, discharging hole. In other cases they will take on a reparative process and leave an irregular cicatrix. The glands in the inter-maxillary space become hard and adherent to the maxillary bones; these hardened glands may be unilateral, corresponding to the side upon which there are lesions in the nasal cavity, or they may appear on both sides. These glands at first present an inflammatory action—they are hot, painful, swollen, and soft in character—but instead of undergoing the usual inflammatory process of glandular structures they become hard and firmly attached to the adjacent tissue, and the maxillary bone.

FARCY,

which is the name for the cutaneous manifestitation of glanders, which is not a distinct disease as is sometimes stated, may be described as *acute* and *chronic*.

The symptons of acute farcy are general or constitutional, and local or diagnostic. The general symptoms are a loss of or impairment of the functions of health, high temperature, accelerated respiration and quickened pulse. The local symptons are a general œdema of the limbs, with heat and pain, and at times lameness; this œdema may subside and there will be noticed circumscribed swellings, following each other and taking the direction of the blood vessels, and lymphatics of the limbs; from these nodulated swellings appear the specific nodules or *farcy buds*. These nodules or ulcers are situated in the cuticle and subcutaneous tissue, and undergo the the same process as do the ulcers or cancers in the nose. Histologically considered these ulcers of the skin are the same as those found in the nose and lungs. These cutaneous ulcers are developed from the nodulated swellings which appear along the legs; they vary in size and soon the central position softens and ruptures, and a grayish-white liquid somewhat sanguinous and of a foul odor is discharged, leaving a deep, pit-like, ragged edge, and which is not disposed to heal. These buds or ulcers frequently undergo rapid disintegration and coalesce with each other, and form a large irregular-edged ulcer, which continues to discharge a viscid, purulent, blood-stained fluid. These ulcers not only develop on the legs, but in advanced cases are to be met with on any part of the body.

Lymphatics and lymph glands of the adjacent tissues become enlarged, swollen and painful upon manipulation, but they seldom undergo suppuration. The fever is of a remittent character, but the pulse remains accelerated. The animal undergoes a rapid emaciation and prostration, and not infrequently all the symptons of acute nasal glanders is developed and the animal succumbs to the disease.

The acute form of glanders and farcy are not so often met with as the chronic forms.

CHRONIC FARCY,

is the most common form of glanders. Its diagnostic symptoms are often vague. There is little or no rise in temperature, and seldom any functional derangement; at times there may be a capricious and depraved appetite, a want of general vigor, but its diagnosis depends chiefly on its local symptoms and these are circumscribed swellings and *buds*, or ulcers on the skin and subjacent tissue. These ulcers and swellings are similar to those described in acute farcy, but they are more distributed over different parts of the body, and are to be encountered on those portions of the skin that are thin and vascular, and near some of the lymphatic glands. They discharge a viscid, purulent fluid, and present the same ragged and unhealthy appearance, and are not disposed to heal. The lymphatics become swollen and corded and stand out in prominent relief on the body, and are inflamed and painful to the touch. In some of the cases of chronic farcy these swellings and the farcy buds or ulcers may take on a healthy action, the swellings subside and the ulcers cicatrize, still only to recur again after a longer or shorter time with greater violence, and frequently they resolve themselves into the acute form of glanders, and the animal dies.

Between these two extremes of the same disease—acute glanders and chronic farcy—may be met many intermediate forms of the disease, and this divergence of phenomena exhibited renders it exceedingly difficult to form an exact and correct classification, and makes it misleading to the most experienced and careful practitioner in dealing with it in daily practice.

The diagnosis of glanders is extremely difficult from the fact of its many varied symptoms, and especially is this the case in the chronic form where all external pathognomonic symptoms may be wanting; but the fact of any suspicious phenomena is sufficient to warrant a questionable diagnosis, and the animal so suspected should at once be isolated and held under observation sufficiently long to allow the development of whatever disease the animal may be laboring under.

In acute glanders there will be little difficulty in determining the disease, but too much care cannot be exercised in the examination of suspected cases, and especially in a stable where glanders has occurred. The prognosis of glanders is always unfavorable; treatment is never justifiable from the fact that it is incurable, and on account of the danger of extension of the disease to man and other animals.

In our railroad stables, where there is so much money involved and where glanders would have so fertile and

suitable a soil for development, the prophylactic or preventive treatment should be employed at all times. All suspected cases that have any doubts as to their condition should at once be isolated and the place where they stood disinfected; the utensils, harness, blankets, and other articles they may have come in contact with removed, and should the animal present the symptoms of glanders it should at once be destroyed and all the articles burned.

None but accredited veterinarians should be permitted to examine either glandered or suspected animals. Special persons should be detailed to care for the suspected, and no healthy horse should be permitted to use the utensils that have been in contact or have been used by the suspected animal unless they have been thoroughly cleaned and disinfected with boiling hot water containing carbolic acid in the proportion of one to twenty.

Suspected horses and stables should be subjected to periodical examinations by a competent veterinarian, and these revisions should occur at least once in eight days.

The stables, floors, walls, sides of stables and mangers should be thoroughly disinfected.

There are many disinfectants and different methods that may be used, but in large stables where economy and effectiveness is required the following system will combine both; namely, to first wash thoroughly all the woodwork and stable-fixings and utensils with *boiling hot* water, permit them to dry and repeat the washing, then saturate them with a solution of the bi-chloride of mercury, one part to fifty of water, and sprinkle the stalls and floors with chloride of lime, and white-wash the walls and stalls with lime water containing one part of carbolic acid to every thirty parts of lime water.

As regards prophylactic medicinal treatment it has been advised by some writers to use the hypo-phosphites of lime and soda, and also chlorate of potassa, to be given to every horse in the infected stable, but their efficacy has not yet been thoroughly tested.

The importance of thoroughly guarding and endeavoring to stamp out this disease may be appreciated when we reflect upon the extent of its ravages in some of the railroad stables of New York City alone.

During the year 1877, in one surface railroad stable containing over twelve hundred horses, thirty-six were destroyed in one day, and during the nine months of that year the company lost three hundred horses, which at the lowest estimate would amount to $37,500, not considering the danger of infecting other horses and the cost of cleansing and disinfecting the stables.

Another stable during the same time and containing nine hundred horses, lost ninety-three horses with the disease; and in another stable where the hospital department alone was examined by request of the Board of Health, of New York City, there were condemned at two visits of the inspecting veterinary surgeon two hundred and twenty-five horses, and yet, considering the fact that so much money was lost, we may still find to-day in our stables and on the tracks cases of glanders in its different forms.

The next disease which we will consider is not so fatal as the former, but more frequently to be met with in our railroad stables; that is, *inflammation of the lungs, pneumonia, pneumonitis*, or more properly termed *'neumonic fever.*

PNEUMONIA,

the name by which it is most commonly known, is an essentially constitutional fever, with local manifestations in the pulmonary substance or parenchyma of the lungs. It was considered to be a simple inflammation of the lung substance with the usual accompanying fever, but clinical history shows that the inflammation is self-limited, undergoes certain changes, terminates with a crisis, has a definite pyrexia, and a premonitory chill. These facts together with the fact that pneumonia cannot be produced by any experimental means, proves that it is constitutional and not local, and should be classed among the essential fevers.

It may be considered under different varities according to the lesions in the lungs. The most common forms are the *lobar* or *catarrhal*, and the *broncho-pneumonia;* the other forms that are to be met with are the *circumscribed, insterstitial* and *secondary.*

THE CIRCUMSCRIBED

is the form where the inflammatory condition is confined to a certain area, and these cases are usually mild, involving but a small portion of a lung and accompanied with a low temperature.

THE INSTERSTITIAL

form is seldom met with; here the inflammatory products are thrown out into the interstices of the lung tissue. It presents grave symptoms and in diagnosing it may be confounded with some other complication.

THE SECONDARY

pneumonia is a variety which follows some depleting condition, or occurs while the animal is convalescing from some other disease. But the form which we will consider and which we will contend with the most in our railroad stables, is the *exudative* or *lobar*, and the *broncho-pneumonia*. In order to fully understand the inflammatory action and pathological condition of pneumonia in a horse, it will be necessary to be somewhat familiar with the structure of the horse's lungs.

The physiological action of the lungs is in all animals the same—that of supplying oxygen to the blood, and removing the carbonic acid gas. But their anatomical structures differ. The lungs of a horse, as in all animals, are divided into two lobes—right and left—occupying respectively the right and left portions of the thoracic cavity. Each lobe is surrounded by an external serous envelope, know as the visceral layer of the pleura. The pleura is a serous sac composed of two layers, a parietal and a visceral layer; the parietal layer is attached to and surrounds the internal surface of the thorax, and the visceral surrounds each lobe of the lung; its office is to supply with moisture and protect the surface of the lung.

The lung proper is composed of a fundamental tissue which is of a bright rose color, soft, elastic, and very resisting. It is partitioned into a number of small lobules by septa of connective tissue, and each of the lobules receives a small bronchial tube known as a bronchiole, and each lobule is surrounded with a net-work of blood-vessels, composed of the capillary ramifications of the pulmonary artery and pulmonary veins, which carry to and take away the blood. The air which the animal

breathes, passing through the nostrils, enters the larger bronchial tube in the throat, then into the smaller tubes of each lobe of the lung, and into the small lobules, where it comes in contact with the blood; and it is at this point that the physiological act of respiration takes place; the air coming in contact with the delicate membrane which surrounds the capillary blood-vessels gives up oxygen and receives the carbonic acid gas, which is thrown off from the blood, and it is within these air-cells or lobules that the inflammatory action of pneumonia takes place.

The first appreciable change resulting from the inflammation is the same here as in other situations, namely, active congestion accompanied with a transudation of serum, this is known as the stage of *congestion* or *engorgement*, from the fact that, the capillary blood-vessels becoming greatly distended with blood, the serum transudes through the walls of the blood-vessels and fills up the small lobules or air-cells; this stage of engorgement may exist from one to three days and it may involve a portion or a whole of a lobe, usually a portion, and that the lower or anterior third of the lobe.

At the end of the second or third day the second stage, or stage of *red hepatization*, takes place, which is the point at which the air-cells and bronchioles, or smaller bronchial tubes, become filled with a solid exudation and cease to contain air. The diseased portion of the lung at this stage is of a brownish-red color, non-crepitant, and when cut presents the appearance of the liver, hence the name hepatization. If the chest is opened at this stage, soon after death, the lung will not collapse at the affected part, and the substance of the affected portion of the lung readily breaks down under pressure of the fingers and does not present the friable appearance as when healthy, and owing to the absence of air the diseased or solidified portion of the lung will sink in water. The dark red color of the lung in this stage is due to the large number of red blood corpuscles which are present in the exudation. This stage of red hepatization may continue to the fifth or seventh day, when the red color begins to give place to a greyish color, and this condition is known as the third, or stage of *grey hepatization*. This stage is the condition in which the inflammatory products are in a process of absorption, the red blood corpuscles lose their coloring matter, the pus cells contained in the exudated serum undergo fatty degeneration, the fibrine becomes granular, so that a kind of granulo-fatty emulsion is formed, which is suitable for absorption by the lymphatics and blood-vessels of the lungs, these changes giving the affected part a greyish color. After the removal of the exudation the air-cells gradually resume their functional capacity, and are found in a few weeks to have sustained no damage.

This is a history of the anatomical changes of favorable cases. But there are a number of variations and complications which may take place.

PLEURITIS,

with fibrinous exudation may be developed in that portion of the pleura covering the affected lung; in this complication the term *pleura-pneumonia* is applied.

PURULENT INFILTRATION,

may take place in the air-cells, the walls of which break down, and there is formed a purulent abcess which may undergo degeneration and become absorbed, or may rupture through the external covering of the lung, and the animal will succumb to pyæmia.

GANGRENE

of the affected portion may occur. *Bronchitis* usually exists with pneumonitis in the affected lobes, but bronchitis should never be confounded with pneumonia, nor does bronchitis, as the primary affection, tend to the development of pneumonia; and the latter has no tendency to give rise to bronchitis save within the affected lobes.

The causes of pneumonia are of a specific character, the nature of which are at present unknown. That it is a purely constitutional and not local disease is now held and believed by all of the most recent investigators; that it is essentially of a constitutional type is not only proven from the fact of its clinical history and anatomical nature, but also from the fact that it cannot be produced by any external or mechanical means.

Its nature and cause is believed to be due to some specific morbid condition of the blood, yet unknown, which nature endeavors to rid itself of by means of the local manifestations in the lung substance; still there are certain influences and conditions which are exciting and predisposing.

Horses that are convalescing from some debilitating disease, or run down and weakened from severe exertion, insufficient food, and bad hygiene are more liable and usually undergo a severe type of the disease. Sudden variations in the temperature, at any time of the year, is a predisposing cause. The removal of horses from a distant place, the excitement and nervous prostration due to the journey, the change of climate, the want of proper clothing and good feed, are inducing causes. The lack of ventilation and insufficient air space in large stables, and the close confinement of a number of horses in a stable without due care given to the removal of the emanations and gases will excite an attack of pneumonia.

Those horses which are exposed to the vicissitudes of the weather and are overworked are most liable, and yet the disease is frequently found among those animals that are carefully nurtured, well groomed, and used only for road purposes. Pneumonia also occurs as a complication of other diseases. Different affections of the kidneys have been supposed to stand in a causative relation to it.

In the middle Atlantic states, it occurs most frequently during the winter and spring months. Some years it prevails more and proves more fatal than others.

The symptoms of pneumonia are as a rule very prominent: anorexia, a dejected coutenance, frequently a cough, although sometimes wanting, temperature increased from 102° to 104° Fahr., pulse and respiration increased, and in most cases there is a well-marked chill which may continue from one to three hours. The bowels become constipated, and the bladder is not evacuated as frequently as in health. These are the general symptoms. The local signs are to be elicited from the chest itself by means of percussion and auscultation. Percussion is an act performed by pressing the middle finger of the left hand firmly upon the different parts of the chest, either upon the ribs or the intercostal spaces, and distinctly and uniformly tapping it with the tips of the closed fingers of

the right hand. By this means if the lung is healthy there will be heard a low, resonant sound over all parts of the lung; but should any portion of the lung be inflamed and contain an exudative product, percussion on that point would elicit a hard, distinct sound without resonance and appear as though one was tapping on a hard substance.

Auscultation is the method by which we listen to the sounds caused by the air passing in and out of the lungs. It is performed by pressing the ear against the different parts of the surface of the chest and listening to the sounds of the air passing in and out. If the lungs are healthy there will be a soft, rustling sound, somewhat approaching a murmur, and might be compared to the gentle rustling of green leaves in the woods. And in the first stage of pneumonia there will be heard over the affected parts a crepitant sound, which might be compared to the sound of salt sprinkled on the fire. This crepitancy will continue for two or three days and then gradually give way to no sound at all, excepting the bronchial sound of the air passing into the larger bronchial tubes, and this want of any sound will indicate the second stage or stage of red hepatization. This lack of respiratory murmur may continue from four to eight days, and then there will be noticed in the sounds a return of the crepitancy, which will indicate a third stage. Should resolution continue favorable a return to the rustling murmur of healthy lung tissue will be found. Auscultation is the best means for determining the condition of the lungs when diseased, and also the most difficult. And to become familiar with the normal and abnormal sounds, one should carefully listen to the sounds of healthy lungs, and then compare them with those that are diseased.

By percussion or tapping the surface of the chest, the diseased portion of the lung will be detected by the sound. Instead of a clear, resonant sound that will be produced over a healthy lung, there will be heard over the affected part a dull, hard sound as though one was tapping on a board, or some solid substance.

In the treatment of pneumonia we must always remember that it is a self-limited disease, has three stages which it undergoes before resolution takes place, and therefore each stage furnishes different therapeutical indications.

Should the case be seen in the first stage that of engorgement, high fever, accelerated pulse and respiration, and presenting the crepitant sound upon auscultation, an endeavor should be made to arrest or at least to lessen the force of the attack. Heretofore, blood-letting, cathartics and the so-called anti-phlogistic methods of treatment have been considered abortive; but experience has abundantly shown that these measures cannot be relied upon, and that they frequently leave the animal so debilitated as to be unable to withstand the remaining stages of the attack.

It has been found in the daily practice of the writer, and verified by the testimony of other practitioners, that if the case is seen in its first stage, a full dose of sulphate of quinia from one to two drachms, according to the size of the animal, will in some cases arrest the disease, and should it not abort the disease, it always leaves a favorable influence in the course of it, by its anti-pyretic effect. Again, in the first stage the rational system of treatment should be employed, the animal should be placed in a roomy, well-ventilated, white-washed stall, containing clean fresh straw and plenty of light; there should be no draught and the animal should be moderately clothed and all the legs to the first joint be bandaged and thus endeavor to keep an equal temperature of the whole body.

Blisters, strong stimulating liniments and thick mustard paste are injudicious, but the applications of a mild liniment composed of aqua-ammonia one part, spirits of turpentine two parts, alcohol four parts and olive oil sixteen parts, gently rubbed on the chest and a bandage of red flannel applied, or what is more convenient in our stables, the best English mustard four ounces to one quart of water, applied with moderate friction and then the flannel bandage applied, will act beneficially, and should simply be used to stimulate the chest-walls and should not cause the animal great uneasiness, for the excitement following the application of strong mustards are frequently productive of unfavorable results.

Water or better gruels composed of oat-meal and water, containing one ounce of nitrate of potassæ and one drachm of chlorate of potassæ to each pailful, should be allowed to remain in the stall for the animal to drink at its pleasure. Nutritive foods and any green foods, if they can be obtained, should be allowed; soaked hay, and mashes composed of bran, cut hay and oats are often found acceptable, but the rule should be to allow the horse whatever he will eat.

During the second and third stages the treatment best adapted to our railroad horses is of a tonic and stimulating character. As a tonic there is nothing equal to quinine, and best administered in the form of a drench composed as follows: Sulphate of quinine, ½ drachm, alcohol, ½ ounce, sulphuric acid, aromatic, ½ drachm, water, 12 ounces, given night and morning, and as a stimulant the balls composed as follows:

Ammonia Carbonate	2 ounces.
Camphor Pulverized	1 "
Nux Vomica Pulr	1 "
Genetian Root Pulr	3 "

Simple syrup, a sufficient quantity to make the mass adhere, and then divide it into six balls and wrap each in a piece of tissue paper. These balls should be given three times a day, and when the disease is approaching the point of crisis, which occurs from the ninth to the twelfth day, these stimulating balls should be given every four hours, and if the animal will drink freely, six ounces of brandy or one ounce of alcohol should be given in a pail of water.

True, there are other treatments, and for which their adherents claim great success, but in the hands of the writer and experience of others who have had the care of surface railroad stables the above treatment has shown the best results.

The prognosis of pneumonia among railroad horses is as a rule favorable; still it should be guarded and a careful survey of the animal made before giving a prognosis.

Should the animal present a healty, robust appearance and there be no indication of complications, there is then reason to expect with the above treatment a favorable result; but if the animal is advanced in age, not in strong condition, and presenting grave symptoms at first, a favorable prognosis should not be given.

(To be concluded.)

Brooklyn Street-Railways in 1885.

THE Brooklyn (N. Y.) City Railroad Company has prospered as usual under President Hazzard's able management, and this in the face of elevated opposition, large outlays for improvements and expenses caused by the city's sewer building. The new stable at Halsey street and Broadway, one of the best ever erected, has been in use since November 4th, and another but smaller depot is under way on Flushing avenue near Marcy. An extension of the Flushing avenue and Myrtle avenue lines has been authorized and a large amount of retracking and paving done. The company's machine-shop on Myrtle avenue was put into successful operation in January, 1885, and has become a great center of usefulness. During the summer, President Hazzard and Messrs. Husted, Thomas and How, of the executive committee, spent much time in inspecting improved methods of surface propulsion, but found none on which the majority cared to risk their funds, the president standing alone for improvement on the final vote.

The Atlantic Avenue Company reached out and gathered in two more roads in the twelve months and started a third wholly new one. It bought the South Brooklyn Central on January 31st, of last year, and leased the Prospect Park line on December 10th. The new line running from Hamilton ferry to the bridge, began operations December 14th. A new stable at the corner of State street and Boerum place went into use the same day, as did also a system of transfers which makes possible a vast amount of traveling for a single fare. On the few remaining roads and those operated through the eastern district there have been few changes, the most notable being the opening of a line from Nostrand and Park avenue to Greenpoint via Lorimer street, and the building of a line on Ralph avenue by the Broadway Company.

The Binghamton Cable Railway.

THE new system of cable railway on trial in Binghamton, N. Y., dispenses with the grip. Two cables are used, one driven in the ordinary manner by a stationary engine, the second and smaller cable taking motion from the first. This second cable is led continuously over a loose drum or pulley fixed under the car. While the drum is free to revolve the cable simply imparts motion to it and the car does not move, but by the application of a brake, stopping the motion of the drum, the car is carried forward with the cable. To stop the car the brake is lifted. The secondary cable comes up through the slot in the cable conduit on the approach of a car, and as it passes drops back again below the level of the street. The value of this invention remains to be demonstrated.

An Electric Tram-Car in Berlin.

THE official trial of an electric tram-car, constructed by Mr. Reckenzaun, took place at Berlin, Germany, on December 12th. No private trials were allowed, the first run being in the presence of the directors of the Grosse Berliner Pferderbahn-Gesellschaft, accompanied by representatives of the municipal authority and inspectors of public safety. The car ran without a hitch and to the satisfaction of all present. The line is not an easy one, there being a curve of thirty-three feet radius to start with, leading up an incline. The temperature was 11° centrigrade below zero, and the rails were partly filled with snow and ice. Mr. Reckenzaun had to start, stop, reverse and vary the speed frequently. The trial was a most successful one.

The Fare-Register Suit.

IN the suit of the Railway Register Manufacturing Company against the North Hudson County (N. J.) Railroad Company for infringement upon the patents controlled by the former company, judgment was rendered the plaintiffs some months ago by Judge Nixon, in the United States District Court, of New Jersey. Recently application was made by the defendants for a reargument of the case, which application was denied.

STREET-RAILWAY NOTES.

THE Chicago City Railway Company has 89.25 miles of track, 20 miles of which are operated by cable at an average speed of 9.5 miles per hour. About half of this length of conduit has a steam-pipe for melting the snow and ice.

THE Newtown (Mass.) Street-Company is to be incorporated with a capital stock of $50,000. Electricity or steam will be the motive-power, and the charter will authorize them to furnish electric-power to the town.

THE City Electric Railway Company has been incorporated at Chicago for the construction and operation of electric elevated, surface, underground, or suspended railways. Capital stock, $3,000,000.

THE West Division Railway, of Chicago, will build a 400-stall stable and a car-barn at the corner of Van Buren street and Kedzie avenue, this coming spring. The buildings will cost $100,000.

THE Duluth (Minn.) Street-Railway Company's entire plant has been sold for $75,000. It has been bought by a new company, which intends to increase the facilities of the road.

THE Appleton (Wis.) Electric Street-Railway Company has been incorporated with a capital stock of $35,000. It is expected that the road will be ready for operation by July.

THE New York District Railway has been incorporated to build an underground line under Broadway from the Battery to Harlem river, via Eighth avenue.

A SCHEME is on foot in Brockton, Mass., looking to the formation of a stock company for the manufacture of street-railway cars in that city.

THE Capital City Street-Railroad Company, of Montgomery, Ala., intends adopting the Van De Poel electric system on their line.

AT the annual meeting of the street-railway companies of Philadelphia, the old officers were reëlected in every case.

THE Rapid City (Dak.) Street-Railway Company has been incorporated in the territory. Capital stock, $100,000.

THE Guanajuato (Mexico) Tramway was opened for traffic on February 5th, the national holiday.

THE elevated road running from the ferry at Hoboken up the Heights now in operation.

New Inventions.

Giles' Car-Coupling,

HARVEY A. GILES, of Dows, Ia., is the inventor of an improved form of car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a perspective view of the front end of a car provided with the car-coupling, and Fig. 2 a top view of two couplings coupled together.

A indicates the draw-head, which is formed with a laterally-projecting horn or hook B, and with a recess C, in its outer end, having a vertical perforation D, passing through it, the recess and perforation being for the reception of the usual link-and-pin, where the coupling is used in connection with a car having the common link-and-pin coupling. The draw-head has a vertical perforation E, at the inner end of the same and at the edge opposite to the edge having the hook, and a pin F, passes through the perforation, and has the inner perforated ends G and H, of a long loop or bail I, pivoted upon it above and

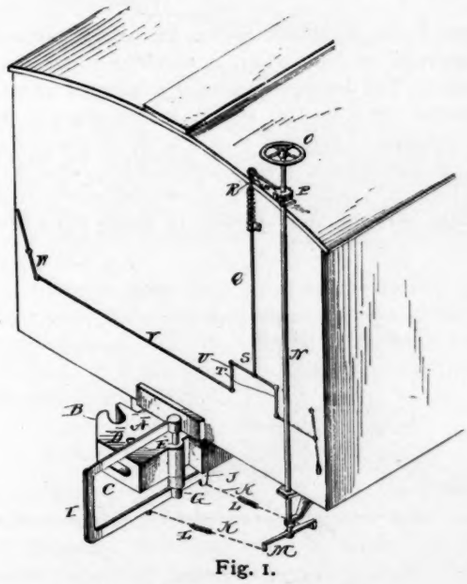


Fig. 1.

GILES' CAR-COUPLING.

below the draw-head, swinging in a horizontal plane. The inner end of the lower arm of the bail or link is extended to form an arm J, and a chain K, is attached to the end of this arm, and a similar chain K, is attached to the lower arm of the link at the same time distance forward of the perforation and the pin as the other chain is back of the perforation and pin. These chains are provided with spiral springs L, at the middle, and are secured at their outer ends to the ends of a bar or lever M, attached at its middle to a vertical shaft N, journaled in bearings upon the front of the car. The upper end of this shaft is provided with a hand-wheel O, for operating it, and near the upper end of the shaft is secured a cogged wheel P, which is engaged by the upper end of a vertically-sliding spring-bolt Q, having a treadle or foot-piece R, at its upper end to the side of the portion engaging the cogged wheel. The lower portion of this spring-bolt is connected by means of links S, to two bell-crank levers T and U, one, T, of which has its other arm projecting out to the side of the car, while the other bell-crank U, has a rod V, attached to its other arm, to the outer end of which rod a lever W, is pivotally attached, this lever and the bell-crank levers being pivoted upon the front end of the car. It will now be seen that when two couplings are brought together the links may first be thrown to the sides by turning the hand-wheel, if not already in that position, and after the ends of the draw-heads have come together the links may be tilted, so as to engage the hooks of the opposite draw-heads, thus coupling the draw-heads.

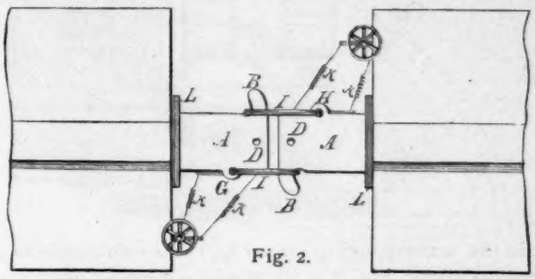


Fig. 2.

GILES' CAR-COUPLING.

The springs in the chains connecting the links with the tilting levers upon the vertical shafts will serve to allow the links to yield slightly to both sides, as the cars will sway from one side to the other during travel, the springs keeping the links in engagement with the hooks and preventing them from being forced out by any motion of the cars.

The spring-bolt will hold the cogged wheel and through it the vertical shaft in position as adjusted, and the links can neither be coupled nor uncoupled without disengaging the spring-bolt from the cog-wheel, the spring-bolt being either depressed by the treadle from the top of the car or by drawing either the outer bell-crank lever or the lever at the other side of the car outward, the bell-crank lever and hand-lever being applied to the front of the car for the purpose of releasing the operating-shaft from the ground, the person standing at the side of the car. After the spring-bolt has been disengaged from the cog-wheel the link may be operated from the ground by tilting the lever upon the lower end of the vertical operating-shaft. The spring-bolt may be of any other suitable construction—as, for instance, it may be a lever pivoted upon the top of the car and having one end engaging the cogs of the wheel, while the other end has a spring bearing upward against it, and a rod may pass down the front end of the car and be pivoted to a crank upon a horizontally-journaled shaft upon the front of the car, this shaft having suitable handles or levers at its ends for tilting it. The link is somewhat wider than the thickness of the draw-head, so that it may be moved up and down upon the bolt, and a washer X, may be placed upon the pin or bolt either above or below the draw-head for the purpose of supporting the link to enable it to engage hooks upon either high or low cars. as the occasion may require.

The inventor claims this form of coupling to be simple and inexpensive, and readily applicable to any form of railway-car, while cars employing it can be coupled to cars using the link-and-pin coupling.

McTyeire's Piston-Packing.

WILLIAM C. MCTYEIRE, of Hatchechubbee, Ala., is the inventor of an improved form of piston-packing, which is herewith illustrated and described. The invention has for its object to provide means whereby a piston-packing shall adapt itself to the wear of the cylinder, so as always to form a steam-tight joint, and means for stopping the passage of steam between the joints of the packing.

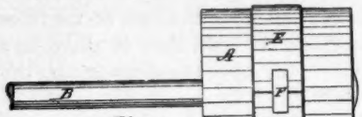


Fig. 1.

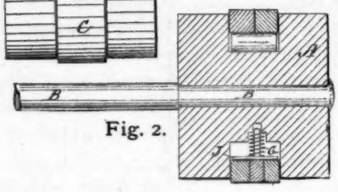


Fig. 2.

MC TYEIRE'S PISTON-PACKING.

In the accompanying cuts, Fig. 1 is a side elevation of the invention; Fig. 2 a longitudinal vertical section of the same; Figs. 3 and 4 are detail views of modifications of the joint, and Figs. 5 and 6 shows modifications of the spring.

A represents the head of the piston, consisting of a solid piece of metal grooved around its center to receive the packing, and bored through its center longitudinally to receive the piston-rod. The piston-rod B, is provided with a shoulder at one end of the piston-head, and it is headed over the piston-head at the other end by riveting with a hammer, so that the head and rod become one and inseparable. The packing is made in segments C D E, first, because a whole ring could not be put into the groove piston-head; and, secondly, in order that the packing may expand and contract from the effects of heat and cold to maintain a tight joint at all times. The joints between the different segments are stopped, to prevent

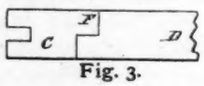


Fig. 3.

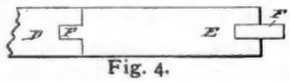


Fig. 4.

Fig. 5.

Fig. 6.

MC TYEIRE'S PISTON-PACKING.

the passage of steam through them, by a cross-bar F, which may be made in different ways. That which is preferred is shown in Fig. 1, in which a perfect ring is first made, and then sawed into the desired number of segments by plane radial cuts. These segments are then slotted in their ends in a plane at right angles to the axis of the cylinder, and the bars F, fitted to these slots to cut off any passage for steam between the ends of the segments.

In the modifications shown in Figs. 3 and 4, a splice or lap joint is made by extending a portion of each segment across the joint to form the bar F, fitting them neatly to each other, and afterward turning the made-up ring to the internal diameter of the cylinder and to fit the groove in the piston. Beneath the segments springs G, are placed, to press them radially toward the cylinder, to keep them in contact therewith and preserve a steam-tight joint at all times. These springs may be of any suitable form, as shown in the different modifications. Fig. 2 represents a spiral-spring; Fig. 5 a semi-elliptic spring, and Fig. 6 a nearly elliptic spring joined at the ends by a presser-plate J. The object of this presser-plate is to enable the spring of whichever pattern may be used to bear equally beneath the ends of two adjacent segments, so as to keep both forced alike against the cylinder, and at the same time to lie as a steam-check directly beneath the joint, to prevent the steam from passing around beneath the edge of the splice.

The inventor claims that this device furnishes a simple, durable and efficient packing. It will effectually prevent the passage of steam between the piston and cylinder, and as it gradually wears the packing will adapt itself to the increased diameter. It is especially adapted for use where high speed is desired, and there is no liability of any part of it becoming loose or deranged.

Bare's Nut-Lock.

JOHN BARE, of Mount Union, Pa., is the inventor of an improved nut-lock, which is herewith illustrated and described. The device is particularly designed for holding the nuts of the bolts that secure the fish-plates or angle-bars of railway rails, but it is also applicable to other uses. It consists in a T-shaped spring-bar, the cross portion of which is desighed to bear beneath two nuts of the fish-plate, and the stem portion of which has a bend or

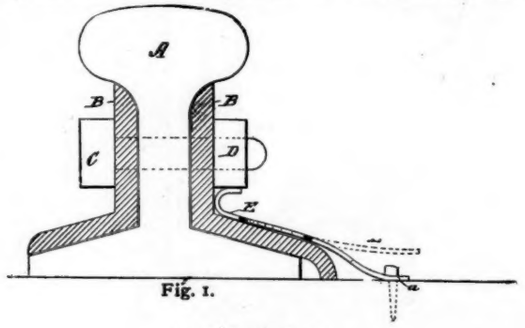


Fig. 1.

BARE'S NUT-LOCK.

set and a perforation, which bend allows the stem, when forced down and spiked to the cross-tie, to exert an elastic tension against the lower sides of the nuts that firmly holds them from turning on the screw-threaded ends of their bolts, notwithstanding the vibration and jar caused by the passing trains.

In the accompanying cuts, Fig. 1 is a cross-section through the angle-plates through the line *x x* of Fig. 2, showing the application of the device; Fig. 2 a side view of the same, and Fig. 3 a modification of the spring lock-bar.

A represents the rail, B B are the angle-bars or fish-plates, C the bolt, and D the nut which fastens the bolt in its position through the rail and fish-plates. E E′ is the improved locking device, which is in the nature of a T-shaped spring-bar made of metal, and whose head or cross-piece E, extends a distance far enough to rest beneath the two nuts at each end of the fish-plate and be-

tween the lower faces of the pair of nuts and the fish-plate. The stem E′, of the spring locking-bar is formed with a slight upward bend, as shown in dotted lines in Fig. 1, and has a hole in its end, through which a spike *a*, passes into the cross-tie. When this spring-stem E′, is bent down and spiked to the cross-tie, it will be seen that an upward tension is put upon the head E, of the locking-bar that causes it to bind against and press upwardly on the nuts, holding them firmly in position and preventing

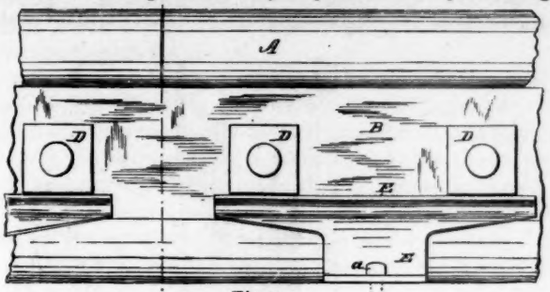


Fig. 2.

Fig. 3.
BARE'S NUT-LOCK.

them from turning. The cross-piece or top E, of the T-shaped bar is preferably bent over or folded on itself, as shown in Fig. 1, so as to fill better the space between the nuts and the fish-plate; and which fold, for greater stiffness, may be extended down to contact with the bar, as shown in Fig. 3.

The inventor claims that his device provides a simple, efficient and reliable nut-lock which can be manufactured at small expense. The device is now controlled by R. Bruce Bare, of Washington, D. C., to whom the patent-rights have been assigned.

Kirby's Canopy for Railway-Car Lamps.

JOHN KIRBY, JR., of Dayton, O., is the inventor of a new form of canopy for railway-car lamps, which is herewith illustrated and described. It consists in devices whereby the canopy may be attached in its normal position to the curved or inclined roofs of railway-cars or other structures in such way as to be capable of adjustment with reference to the position of the flame or light against which it is desired to protect the roof. Heretofore it has been customary to make these canopies especially to suit the curve or pitch of the deck of a car or other structure, because if not so made they will not hang with their lower edge at right angles with the lamp-chimney; yet it is desirable that it should so hang. The present invention enables the canopy to be so hung that it may be in normal position whatever the pitch of the roof may be, and the canopy may be used in any car, and has the further advantages over the canopy made especially for a particular structure that it may be made in quantity and held in stock—a very important advantage to the manufacturer and consumer.

In the accompanying cuts, Fig. 1 shows the canopy attached to a railway-car, and Fig. 2 is a central vertical section of the same.

A represents the outside curved roof of a railway-car, B the inside curved roof of the car, and C a tube passing through the roof to carry off the product of combustion of the lamp. The canopy is constructed as follows: D is a hollow ball, preferably spun of sheet metal, and having on opposite sides the openings *g* and *g′*. The opening *g′*, is provided with a screw-thread, as shown. G is the canopy proper, and has an opening screw-threaded and adapted to screw into the screw-threads of the opening *g′*, of the ball D. F is a tin or other sheet-metal collar having an opening in the center of less diameter than the

Fig. 1.

KIRBY'S CANOPY FOR RAILWAY-CAR LAMPS.

diameter of the ball D. E is a collar, preferably made of sheet metal spun or otherwise formed into the desired shape, having also an opening in its center of less diameter than the diameter of the ball D. The collars F and E, form a socket, and are held by screws or in any convenient way firmly to the inside roof of the car.

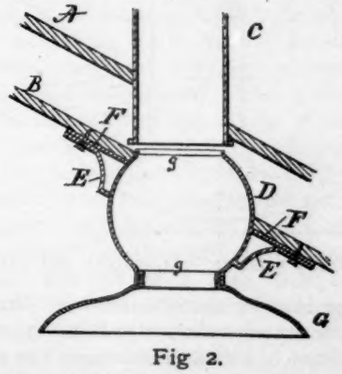


Fig 2.

KIRBY'S CANOPY FOR RAILWAY-CAR LAMPS.

The canopy is attached to the car-roof as follows: The collar E, is brought up on the ball D, from below as far as its diameter will allow. The canopy proper G, is then screwed onto the ball, and the collar F, is brought down on the ball D, as far as its diameter will allow. The flanges of the collars F and E, are then brought together and firmly affixed to the roof.

It is evident that since the diameter of the openings in the collars is less than the diameter of the ball they cannot come together, and that they form a socket to hold the ball D, free to move between them. The ball D,

with the canopy G, may thus be placed at any angle to the roof, and held firmly in the desired position at right angles to the chimney of the lamps. The ball D, as described, becomes part of the flue for the escape of the results of combustion. Where, however, the lamp is at such a distance from the canopy as not to require an outlet for the results of combustion, the ball may be made without the opening *g*. In this case the lower opening may also be dispensed with, provided the ball D, is furnished with a screw-threaded collar or other means of attachment to the canopy.

The inventor claims that this form of car-lamp canopy is simple, easy of adjustment, and can be manufactured at small expense. It is now manufactured by the Dayton Manufacturing Company, of Dayton, O., of whom further particulars may be obtained.

Cornell's Electric Time-Signal for Railways.

GEORGE CORNELL, of Crystal Run, N. Y., is the inventor of an improved electric time-signal for railways, which is herewith illustrated and described. The signal is especially designed for use in railway-stations and at dangerous points to indicate the time elapsed between trains passing the station.

In the accompanying cuts, Fig. 1 is a broken front elevation of the signal, and Fig. 2 a detailed sectional elevation of the same on the line *x x* of Fig. 1.

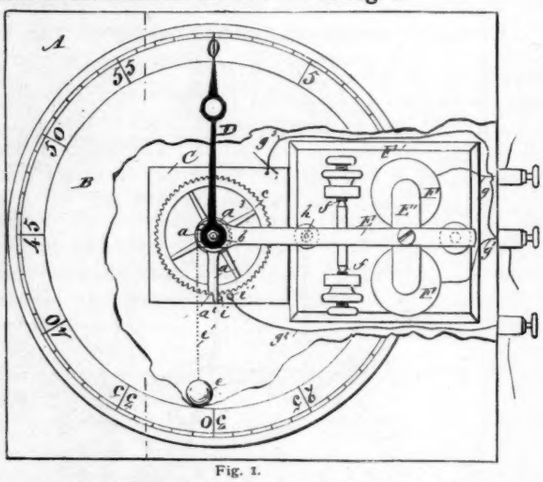


Fig. 1.

CORNELL'S ELECTRIC TIME-SIGNAL EOR RAILWAYS.

A represents an inclosure, to the front which is formed or secured a stationary indicator B, having minute-graduations marked in a circle thereon, similar to the dial of a clock. Within the inclosure A, is secured another inclosure C, or suitable frame-work, containing ordinary clock mechanism that serves to turn the hand or pointer D, in front of the dial or stationary indicator B. The pointer D, is provided with the sleeve *a*, which fits loosely upon the hand-arbor *b*, of the clock mechanism, and the arbor *b*, is made of considerable length in front of the cog-wheel *c*, secured upon the arbor, to permit the pointer D, and sleeve *a*, to slide outwardly upon the arbor. The sleeve *a*, is formed with an annular groove *d*, to receive the forward end of the lever E. It is also provided with the arm *a'*, which is provided with a pin or stud a^2, for connection with the cogs of the wheel *c*, for causing the sleeve *a*, and pointer D, to be revolved by the clock mechanism. The sleeve *a*, is also provided with the small pulley a^3, to which the weight *e*, is attached by a cord *e'*, so that when the sleeve *a*, and pointer D, are revolved by the clock mechanism the weight *e*, will be elevated to return the sleeve and pointer to the "naught-point," when the sleeve is disconnected from the clock mechanism. The lever E, is pivoted between the points *f f*, and is provided with the armature-plate E', held in front of the poles of the electro-magnets F, which are held in the

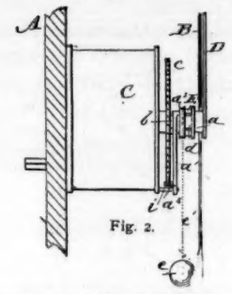


Fig. 2.

CORNELL'S ELECTRIC TIME-SIGNAL FOR RAILWAYS.

inclosure A, on the base F', and are connected by wires *g g'*, to a battery and to a device to be operated by trains of cars passing the signal, for opening and closing the electric circuit through the magnets F. When the circuit is open, the forward end of the lever E, is drawn toward the clock mechanism C, by a spring *h*, which movement of the lever causes the sleeve *a*, to be set back by the lever toward the cog-wheel *c*, so that the pin a^2, of the arm *a'*, on the sleeve will engage with one or the other of the teeth of the cog-wheel *c*, thus connecting the hand D, with the cog-wheel, so that the hand will be moved around in front of the dial B, by the clock mechanism like the minute-hand of a clock.

The revolution of the sleeve *a*, will wind up the cord *e'*, and elevate the weight *e*. A passing train, as above mentioned, will close the circuit to the magnets F, which will operate the lever E, and cause it to force the sleeve *a*, the hand D, and the arm *a'*, outward away from the clock mechanism C, which movement will disengage the stud a^2, from the teeth of the cog-wheel *c*, and permit the weight *e*, suddenly to reverse or return the hand D, which will be returned to the naught-point and there stopped by a pin *i*, against which the arm *a'*, strikes, as shown in Fig. 1. The arm *a'*, is made exactly opposite to the hand D, to act as a counterbalance-weight to the hand, so that a light weight *e*, may be used to return the hand. The distance the hand D, travels from the naught-point around the dial toward the 55-point before being released indicates the time elapsed since the last interruption of the forward movement of the hand, so that an engineer of a train of cars approaching the signal may know how long a time has elapsed since the preceding train passed. The hand D, is stopped at the 55-point by the stop-pin *i'*, so that confusion will not arise by the hand D, making more than a complete revolution over the dial.

The stop-pin *i'*, is insulated from the clock-frame, and is connected by a wire g^2, with one pole of the battery. The clock-frame is connected with the other pole by the wire g^3, so that the contact of the arm *a'*, with the stop

i', closes the electric circuit to the magnets F, which operates the lever E, and detaches the hand from the gear *c*. The weight *e*, instantly resets the hand D, and as the circuit is so quickly broken the hand will go back but one cog. This will continue without stopping the clock until a train passes, when the hand will be set back to naught. Instead of an open a closed circuit may be used for operating the lever E, with like results. No special manner of attaching the mechanism to the track is provided, as there are several circuit-closing devices in use which are open to all.

It is claimed by the inventor that ordinarily a road could equip all of its dangerous curves with this device for so small a sum, that if one accident should be averted thereby the saving to the road would pay for the entire equipment of the device. The cost of operating the device is very slight, requiring but one Leclanchi cell of battery per signal, the signals to be wound up daily by the track-walkers. Besides the stationary cog-wheel and the clock movement to which it is attached and the stationary magnets and their armature, the mechanism is reduced to to one piece of metal, as all the rest of the parts are attached permanently and belong to the sleeve. The friction and liability to derangement is thus reduced to a minimum. The clock mechanism bearings need not necessarily be made very tight as correct time is not rerequired, one or two minutes variation per hour amounting to but little in fifteen minutes, and thus the clock can be made less liable to be affected by changes of temperature.

Carpenter's Furnace for Steam-Boilers.

PROFESSOR ROLLA C. CARPENTER, of Lansing, Mich., is the inventor of an improved furnace for steam-boilers, which is herewith illustrated and described. The objects of the device are to furnish a supply of air to the unconsumed carbon rising in the form of smoke, soot, and gas from the mass of coal, to deflect the mingled carbons and

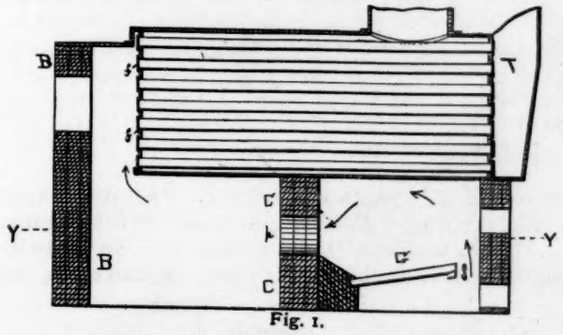


Fig. 1.

CARPENTER'S FURNACE FOR STEAM-BOILERS.

air from contact with the boiler—which is always at a much lower temperature than that necessary to produce combustion—until the combustion of the carbons shall have been perfected, and to produce a perfect combustion of the gases, smoke, and soot.

In the accompanying cuts, Fig. 1 is a perpendicular sectional view of the improved furnace, and Fig. 2 a horizontal sectional view.

A represents the boiler, and B the outer walls of the furnace. C is a bridge-wall, which is built of refractory material, and is built up close to the boiler, leaving only sufficient space for the expansion of material. Through this bridge-wall are one or more perforations having their combined area equal to or less than the area of the tubes in the boiler above. The bridge-wall is preferably built quite thick, so as to present a large surface at the apertures. The perforations do not extend to the top of the bridge-wall, but a portion of the solid wall is built above them for the purpose of deflecting the moving air and combustible matter from too near an approach to the body of the boiler. Between the bridge-wall and the front of the furnace-wall is placed a grate G, having an ash-pit below it, as is usual, but so mounted that there is between the front wall of the furnace and the forward end of the grate an open space, shown at S S, having its

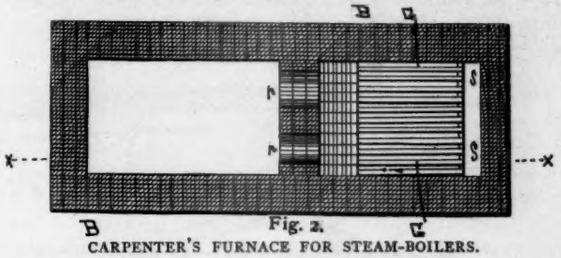


Fig. 2.

CARPENTER'S FURNACE FOR STEAM-BOILERS.

area about equal to one-half that of the perforations in the bridge-wall. The requisites of this opening are, that it shall not be clogged by throwing coal or combustibles over it, and that it be constantly kept free for the passage of air; but the opening in whatever form should have an area less than or about equal to one-half the area of the perforations in the bridge-wall, and so constructed that they shall be kept constantly open and free from choking combustibles. A current of air entering through the ordinary damper-openings in the front of the furnace passes in part through the burning coal upon the grate and in part through the aperture S S, in front of the grate, and the latter portion, while passing over the coal toward and through the openings in the bridge-wall and there mingling with the unconsumed combustible material rising from the coal, furnishes a fresh supply of oxygen, and promotes complete combustion as the mixed air and combustible material pass through the perforations. The location of the perforations in the wall at a distance below the boiler causes the combustible material to be drawn away from the comparatively cool boiler, and prevents the cooling of the gases and their consequent failure to burn. The hot gases, with their combustible material completely burned out, pass on their way to the chimney through the flues *f f*, and there part with their heat to the water surrounding the flues.

The aperture S S, can be utilized by the fireman for the ready removal of clinkers, and its presence compels the proper admission of air over the top of the burning coal, in spite of the most careless attention of the fireman. The grate G, may be set either horizontal or raking. It is preferable to set it with the rear end lower, as such a setting causes the coal to work constantly backward and away from the aperture S S.

Furnaces constructed as above described have been in use for some months in the Michigan State Agricultural College and also in the State School for the Blind at Lansing, and have given entire satisfaction. A considerable economy of fuel has been effected by their use.

Lane & Thorp's Car-Starter.

JOHN A. LANE and JAMES M. THORP, of Detroit, Mich., are the inventors of an improved car-starter for use on street-railway cars, which is herewith illustrated and described. It consists in a device by which the power of the horse is temporarily applied to give a rotary impulse directly to the wheel, so as to revolve the wheel partly and then transfer the power to the usual conditions for draft purposes.

In the accompanying cuts, Fig. 1 represents a side view of the device; Fig. 2 a top view, and Fig. 3 an enlarged sectional view of the draw-bar H, two anti-friction rollers *d e*, and the hook *f*.

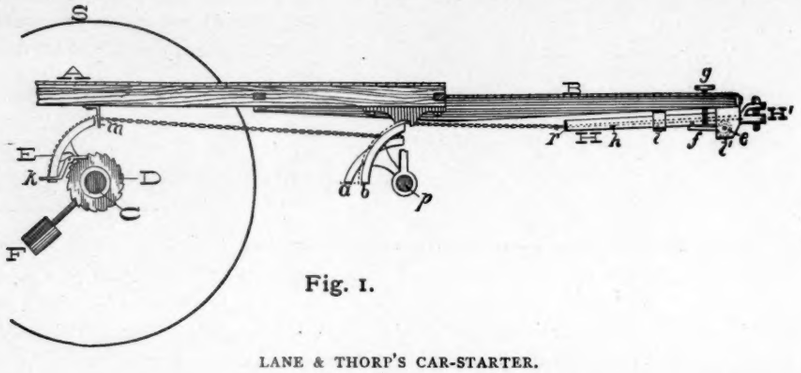


Fig. 1.

LANE & THORP'S CAR-STARTER.

A represents the car-bottom extending back over the wheels, one of which is represented by S, and B is the car-platform. Under the platform by suitable hangers is attached the draw-bar H H', adapted to move backward or forward until such motion is stopped by the stop *r*, or the draw-bar H', striking against the hanger *i*, or the hanger *i'*. Between the rear end of the draw-bar, when completely back, as shown, and the axle of the wheel, is hung a block or counter-shaft having two sectors of circles *a b*, turning upon a common axis *p*, the periphery of these sectors being spiral to the axis on which it turns. This forms a differential sector-pulley by the use of which the draft is transferred gradually and without a shock from its action in giving a rotary motion to the wheel to its ordinary conditions for draft purposes. Upon the axle C, of the wheel is fixed the ratchet-wheel D, and mounted loosely beside it is a sleeve carrying another sector-pulley E, which carries a pawl adapted to engage in the teeth of the ratchet-wheel D. This sector has its periphery spiral to the axle also, and thus it reduces the leverage as the car gains motion. On the sleeve is fixed an arm holding a weight F, by means of which the mechanism is set in position for starting, as shown in the cuts.

From the rear of the draw-bar H, a chain passes to the differential sector-pulley *b*, passing around to the rear or lower part. Another chain attached to the upper and forward part of the sector A, passes to and around to the rear of the sector E, upon the axle of the wheel. The forward motion of the draw-bar acting through the chains and over the variable differential sectors *a b*, through the sector E, pawl K, and ratchet-wheel D, rotates the wheel S, upon its axis until, in the course of its revolution, the pawl K, is brought against the lug M, attached to the car-bottom, thus throwing it out of gear; and at the same time the beveled stop *h*, slips over the hook *f*, thus holding the draw-bar from pulling back, and the usual draft conditions are established. By pressing on the foot-piece *g*, which springs down the hook *f*, and releases the draw-bar, these motions will be reversed by the weight F, and the mechanism set to start the car again. By the use of the differential sector-pulleys *a* and *b*, two results are accomplished: First, the leverage is increased and consequently the power applied to rotate the wheel S, to any desired extent; and second, as the power begins to be effective the difference in the gearing becomes less, thus bringing the draft gradually and not suddenly into the usual conditions for moving the car upon the track.

Fig. 3 shows the hook *f*, dropped and also turned down. It is to be pivoted on the axle of the roller *e*, and

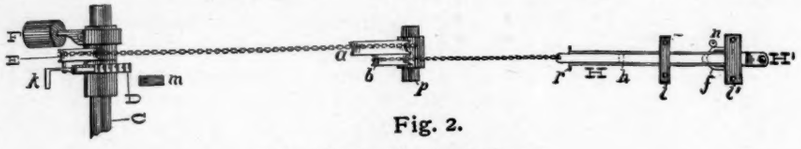


Fig. 2.

LANE & THORP'S CAR-STARTER.

to be held up by the two springs *x x'*. *n* is a plate on the side of the hook *f*, to receive the shank of the foot-piece *g*. There may be a shield of sheet iron placed under and in front of the hanger *i'*, to keep the mud out of the

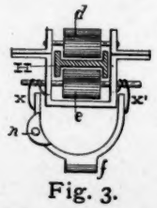


Fig. 3.

LANE & THORP'S CAR-STARTER.

rollers and hook. The foot-piece may be taken out when the car is going the other way, so as to prevent any one on that end of the car from setting the starter. The draw-bar should always be out when not ready to use.

This car-starter is claimed by the inventors to be simple in construction, strong, durable, and readily attached to any car. It is further claimed to be as nearly automatic as possible. A test with a model has shown a power of three to one, tending to demonstrate that by the use of the device one horse may start a loaded car as readily as three horses without the aid of such device. If more power is needed the diameter of the forward sector-pulleys can be increased to twice that shown in the cuts.

Vogel's Electric-Alarm for Locomotives.

WILLIAM VOGEL, of Chicago, Ill., is the inventor of an electric-alarm for locomotives, which is herewith illustrated and described. The invention provides an improvement in electric alarms or signals for locomotives on approaching switches, stations, bridges, etc.; and it consists in the combination of a number of electrical contacts, corresponding to the number of tracks with which the switch connects, and which are electrically connected to a corresponding number of contacts which are placed at the switch, a switch-rod which is connected with the ground-battery, and which is provided with a device for resting upon one of the contacts, a ground-battery which is connected to the rails of the main tracks, and a suitable operating mechanism placed upon the locomotive for the purpose of sounding an alarm and exposing a sign or signal to the engineers, showing whether it is safe to proceed or not. The object of this invention is to attract the attention of the engineer in passing a certain point which is distant from the switch, and, by exposing a signal or sign, notify him whether the switch is making connection with the right track or not.

In the accompanying cuts, Fig. 1 is a plan view of the track and the connections; Fig. 2 a detail view showing the connections between the contacts on the locomotive and those on the track; Fig. 3 shows the connection between the switch and the contact point; Fig. 4 shows the electrical apparatus on the locomotive; Fig. 5 shows the connection between the electro-magnets and the drops; Fig. 6 shows the signs used on the locomotive to notify the engineers; Figs. 7 and 8 are detail views of the electro-magnets, and Figs. 9 and 10 different views of a modification.

A represents the main track, B the switch, and C the switch-arm for moving the switch so as to connect the main track A, with any one of the tracks on beyond the switch. At any suitable distance from this switch, in between the rails of the main track, will be a suitable number of contact-points G, (shown especially in Fig. 2) and

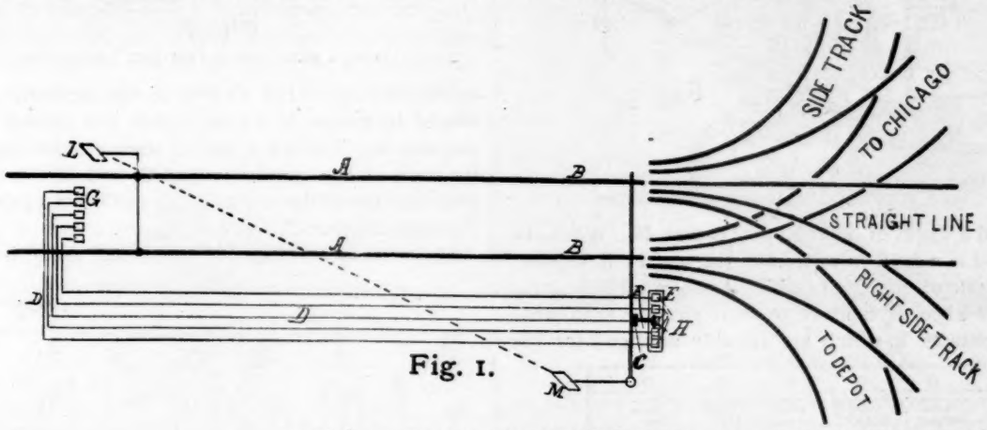


Fig. 1.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

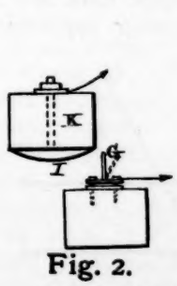


Fig. 2.

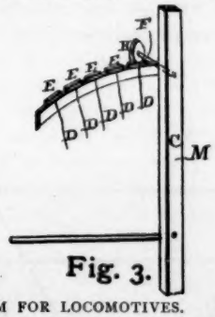


Fig. 3.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

which will project any suitable distance up above the tops of the main rails of the tracks. Of these contacts G, there is a number corresponding to the number of tracks with which the switch B, connects. Each contact G, is insulated from the cross-tie upon which it is placed by a suitable bed or cushion of rubber, or any other suitable substance. This rubber serves both to insulate the contacts

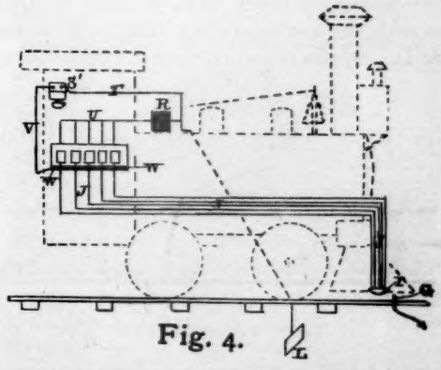


Fig. 4.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

G, and to allow them to be bent slightly forward when struck by the locomotive, as shown in dotted lines, so as to allow the locomotive to pass freely over them. Each one of these contacts G, is connected by means of a wire D, which runs along upon the poles placed by the side of the track to the corresponding insulated contacts E,

placed just beside the switch-rod. Connected to the switch-rod C, is a ground-battery M, and connected to the rails of the main track near the contact-points G, is a second ground-battery L. Secured to the switch-rod of the lever is a short arm F, to the outer end of which is

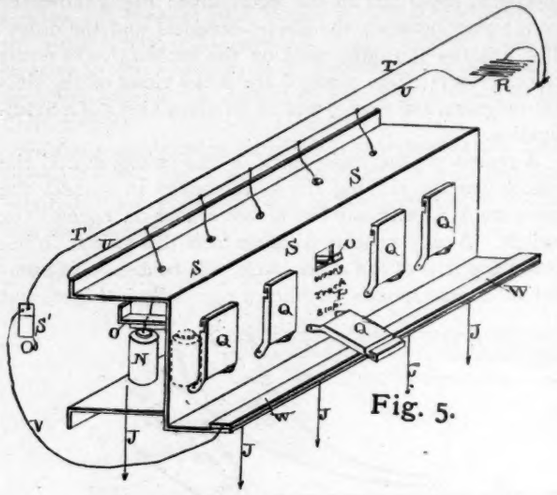


Fig. 5.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

connected a wheel or other similar device H. When the switch-rod is moved so as to make the switch B, connect with any one of the tracks which connect with the main track, this wheel H, is made to move along over the tops of the contacts E, which are suitably arranged for the

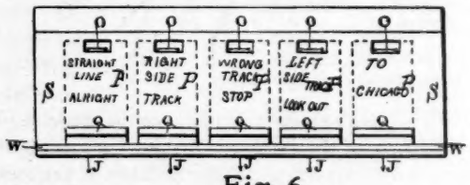


Fig. 6.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

purpose, and whenever the switch B, is made to connect with one of the tracks, this wheel H, rests upon the top of the corresponding contact, so as to make electrical connection with the corresponding contact G, by means of the wire D. By this construction it is impossible to move the switch-lever without forming an electrical connection between the corresponding contacts E and G, for the purpose of communicating with the engineer when the locomotive passes over the contacts G.

To the under side of the pilot of the locomotive will be secured the cross-bar K, to the under side of which are secured a number of curved contacts I, which are arranged in such relation that when the locomotive passes over the contacts G, every one of the contacts I, will make connection with the corresponding contacts G, and as the contacts I, pass over the contacts G, the contacts G, will be forced forward, as shown in Fig. 2. Each contact I, on the locomotive, of which there will be a number

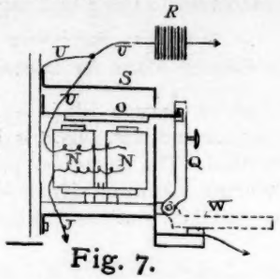


Fig. 7.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

corresponding to the number of the contacts G, is connected by means of a wire J, with the pairs of electro-magnets N. There is a pair of these electro-magnets N, for each of the contact-points G, and for each of the electro-magnets there is an armature O, and a corresponding sign or signal P, and drop Q.

Upon the locomotive, at any suitable point, is placed a

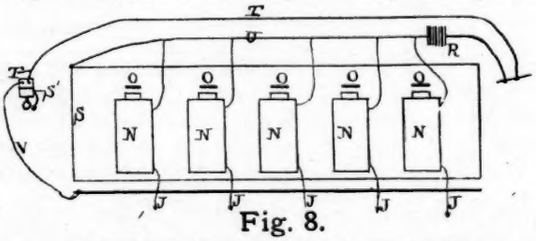


Fig. 8.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

battery R, which connects with the pairs of electro-magnets N, and with the frame S, at one pole, and with the boiler or any other suitable part of the locomotive at the other pole, and to the alarm-bell S'. The current which is connected with the locomotive is intended to pass down through the wheels to the main track, and thus form connection with the currents which pass from the

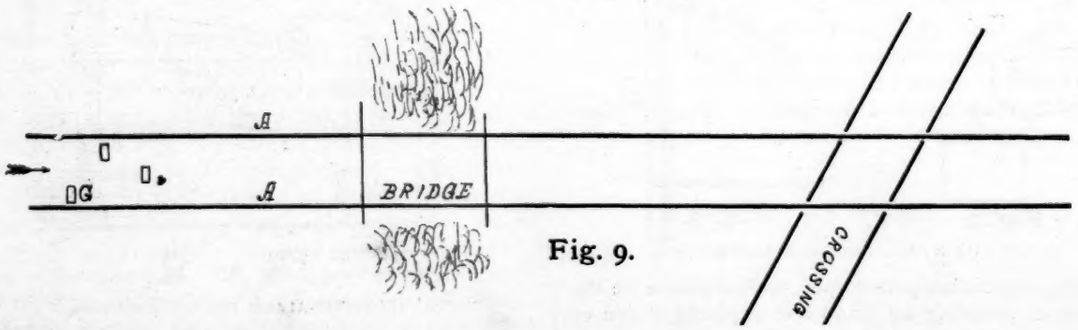


Fig. 9.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

ground-batteries L M. From one pole of the battery passes the wire T, which connects with the alarm-bell S', and the wire U, from the other pole, for connecting with the electro-magnets and the insulated frame S. From the alarm-bell extends the wire V, for the purpose of con-

necting with the insulated support W, upon which the drops Q, fall.

When a current is passed through any one pair of the electro-magnets N, in passing over the contacts G, the the armature O, is drawn downward, which releases a drop Q, from the hook end of the armature, and the drop falls upon the support W, which is suitably insulated from the frame S, and connected by the wire V, to the alarm-bell S′. When the drop Q, falls, a sign or signal of any suitable kind—such as is shown in Fig. 6—is exposed at the same time that the alarm-bell S′, is sounded by the passage of a current through the frame-support W, wires V T, and alarm-bell. A glance at the sign or signal exposed shows the engineer whether it is safe to proceed or not. For instance, the locomotive is moving in the direction of the switch, and the contact-points I, on the locomotive strike against the contact-points G. As above described, moving the switch rod into any desired position makes electrical connection between one of the contacts G, and one of contact-points E, by stopping the wheel H, upon one of the contacts E. If the connection

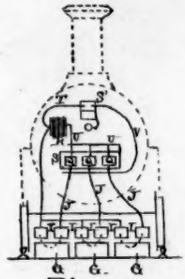


Fig. 10.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

is not to be made with that portion of the main track which is beyond the switch, and the switch is moved so as to connect with this portion, this wheel H, will rest upon the central contact E. Then the corresponding contacts G I, are in condition to have a current passed through them, through the wire J, through the corresponding pair of electro-magnets N, and the battery. The armature O, being drawn downward by the closing of the circuit, the drop Q, falls and the alarm-bell instantly sounds for the purpose of attracting the engineer's attention to the sign "wrong track," which is exposed by the falling of the drop Q. When the contacts I G, make connection, a circuit is passed through one of the wires T, electro-magnets N, wire V, battery R, through the boiler, through the wheels, the rails of the main track, down to the ground L, through the ground to M, through the switch-rod C, wheel H, contacts E, wire D, and contact G.

When it is simply desired to show the engineer where he is on the track at night or in foggy weather, the contacts G, on the track will be made wider, and then there will be two contacts I, on the locomotive for each one G, and no wires D, or switch. When contact is made between the one G, on the track and the two contacts I, on the locomotive, a current is passed from the battery down through the three contacts back through the wires J, and electro-magnet, to the other pole of the battery. These contacts may be arranged along the track at any desired point, and used to indicate bridges, curves, crossings and stations, and each contact will have its corresponding sign, so as to let the engineer see just where he is or what he is coming to.

This device is now entirely controlled by Adolph Zeller, of Chicago, to whom the patent-rights have been assigned.

Ursbruck's Nut-Lock.

JOSEPH B. URSBRUCK, of Philadelphia, Pa., is the inventor of an improved form of nut-lock, which is herewith illustrated and described. It consists in the combination, with a screw-bolt, of a recessed or chambered nut, and a locking-weight fitting in one of the recesses of the nut and serving to oppose by its gravity the tendency of the nut to turn upon the bolt in the direction of release from its bearing upon the member which the bolt secures

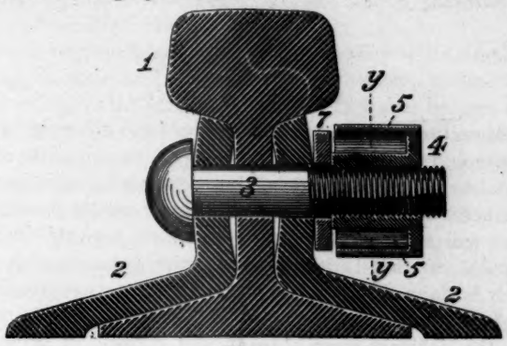


Fig. 1.

URSBRUCK'S NUT-LOCK.

in position. The invention is here shown as applied in connection with a rail-joint, but it is equally applicable in any other construction in which it is necessary or desirable to hold a nut securely against displacement from normal position upon a bolt.

In the accompanying cuts, Fig. 1 is a vertical transverse section through a rail-joint illustrating the application of

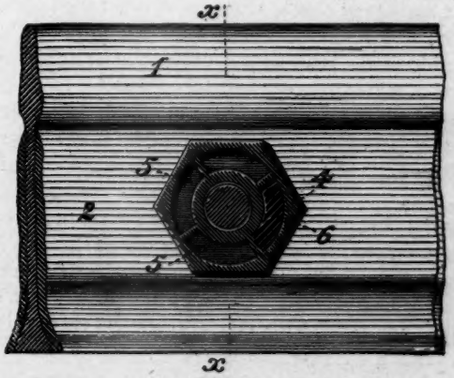


Fig. 2.

URSBRUCK'S NUT-LOCK.

the invention on the line *x x* of Fig. 2; Fig. 2 a side view, in elevation, of the same with the bolt and nut in section on the line *y y* of Fig. 1, and Fig. 3 on the following page a view of the weight detached.

The bolt 3, by which the fish-plates 2, and rail-sections 1, are connected, is provided with an ordinary screw-thread, which is engaged by a nut 4, exteriorly of the usual form, but differing from the ordinary nut in having

a series of recesses or chambers 5, formed within its body between a central core in which the thread is tapped and an external shell, these chambers being separated by radial ribs or partitions, which assist in maintaining proper strength in the nut. The chambers 5, are preferably, as shown, of segmental form, and either of them is adapted to receive a correspondingly-shaped locking-weight 6, which is inserted in one of the chambers and which, when the nut is screwed to a bearing against one of the fish-plates 2, or as is usually the case, against an interposed washer 7, will stand partially or wholly below the axis of the bolt, with its lower end in advance in the direction of the rotation of the nut in being screwed onto the bolt.

Fig. 3.

URSBRUCK'S NUT-LOCK.

It will be seen that the tendency of the nut to be jarred loose and be displaced by rotating in the opposite direction is counterbalanced by the preponderance of gravity induced on one side of the bolt by the weight 6, and the nut will thereby be held in operative position without the use of a nut-lock, ratchet, or other extraneous device.

It is claimed by the inventor that his device provides a light and strong skeleton nut of the usual form, adaptable to the ordinary screw-threads and capable of being attached and removed by any common wrench without requiring extraneous devices in its application and use.

Chamberlain's Car-Coupling.

COURTLANDT A. CHAMBERLAIN, of Canton, N. Y., is the inventor of an improved form of car-coupling, which is herewith illustrated and described. The device is of that form of coupling in which gravity, without any aid from springs or elastic media, is wholly relied upon for the work; and it consists in a draw-bar provided upon the one side of its head with a projection or arm cast solidly thereon, with a central journal or bearing at its outer extremity, while upon the diametrically-opposite side of the head a laterally-projecting engaging-jaw having a forwardly-inclined contact-face and a rear vertical face is cast, this head being combined with a vertically-swinging coupling-link carrying at its forward extremity a laterally-projecting jaw, whereby when the jaw of the link is forced against the inclined contact-face of the fixed engaging-jaw it rides freely over the apex and drops into engagement at any point with the rear vertical face of the fixed jaw.

In the accompanying cuts, Fig. 1 represents in perspective view the coupling as applied to an ordinary draw-bar, one of the draw-bars being in place upon the end of a box-car while its fellow is represented as disengaged from the adjoining car; Fig. 2 a plan view of the couplings in position between two cars, and Fig. 3 a detailed view showing a preferred construction of the journal of the coupling-link.

A is the ordinary draw-bar, having the shank *a*, about which the ordinary spring is coiled and secured, and the squared or prolonged portion *a'*, for engagement with the bed-frame of the car. It is also provided with the ordinary buffer-head *a''*, having the horizontal link-opening in its face and vertical pin-opening for the common link-and-pin connection of the ordinary freight-car. Upon one side of the head, and cast integrally therewith, is provided the projection B, terminating centrally in a

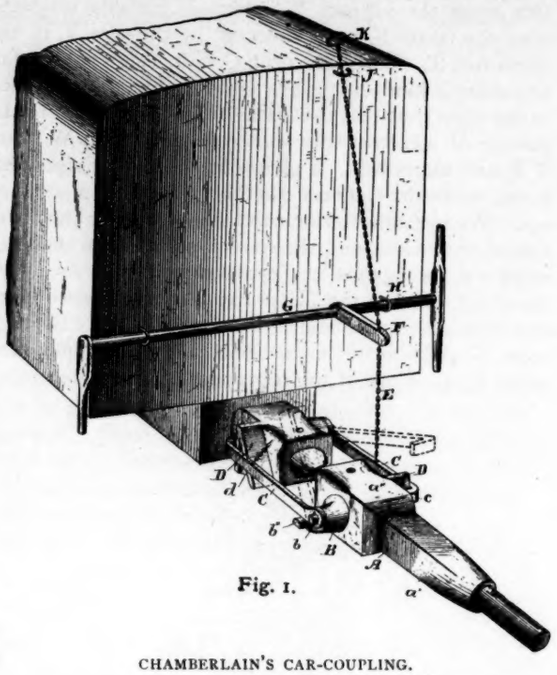


Fig. 1.

CHAMBERLAIN'S CAR-COUPLING.

journal or bearing *b*. This bearing or journal is made of steel or some equally durable metal, and secured in the projection or arm of the head, as shown in Fig. 3, by a key or other locking device *b'*. Upon the lower forward limb of the projection B, is made a further smaller projection or shoulder *b''*, which may be cast integrally with the entire draw-bar and head, or may be preferably at-

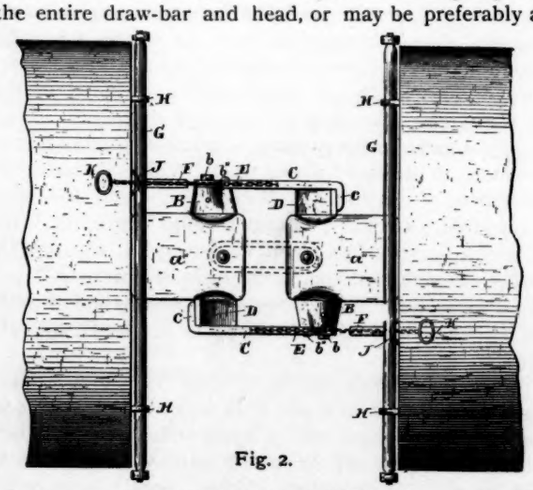


Fig. 2.

CHAMBERLAIN'S CAR-COUPLING.

tached, for security and permanence of wear, as shown in Fig. 3, being also made of steel or other durable metal, and seated within an opening or socket tapped into the projection B, in any of the well-known methods. This shoulder is broad and has an upper bearing-surface acting

as a fulcrum for the coupling-link presently to be described. It has been found, however, that an ordinary cast shoulder upon the projection B, has withstood the severest test of actual service. Upon the journal or bearing *b*, is pivoted the coupling-link C, secured by a locking-pin *b'''*. The forward end of this link terminates in the lateral engaging-hook or jaw *c*. The forward or contact face of this hook or jaw is slightly inclined to enable it to rise freely over the inclined face of its complementary engaging-jaw D, to be presently described. The rear or engaging face of the jaw or hook *c*, is not at a right angle to the length of the link, from which it projects laterally, but makes an angle that is slightly acute to the line of the link, for a purpose which will presently be shown.

Diametrically opposite the projection B, upon the side of the head, projects the engaging-jaw D. The forward face of this jaw is inclined from the vertical, and presents its face squarely toward its engaging-hook C. The jaw D, stands out at right angles to the plane sides of the buffer-head, with its forward or contact face inclined, as before described; but its rear or engaging face

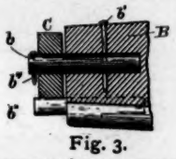


Fig. 3.

CHAMBERLAIN'S CAR-COUPLING.

is not only at right angles to the side of the head, but is also in a plane that is truly vertical. In casting the draw-bar this jaw is made integral therewith, care only being taken that its contact and engaging faces be perfectly smooth. The body of the jaw may be recessed, as shown at *d*, or if preferred it may be made as a solid projection.

Attached to the coupling-links is the chain E, which engages with the rigid arm F, upon the rock-bar G, carried in guide-eyes H, upon the end of the car. The rock-bar is provided with handles at either end, by which the links may be lifted; or if preferred, the uncoupling may be performed from the roof of the car by means of a continuation of the chain to the eye J, through which the end of the chain is kept from slipping by the large terminal ring K.

The operation of the device is as follows: Cars equipped with the coupling as described, on coming together engage automatically the link pivoted upon the projection B, and supported in horizontal position upon the fulcrum or shoulder *b''*, rising easily up the inclined front face of the jaw D, and dropping by force of gravity, as soon as the apex is reached, behind the same and into close engagement with the vertical rear face thereof. Each head being provived with a coupling-link upon one side and an engaging-jaw upon the other, the engagement is simultaneous and complementary. The motion and jolting of the cars serve only to make the slightly undercut rear face of the hook or jaw *c*, engage more closely with the vertical face of the jaw D. This latter jaw, it will be observed, is in vertical height the whole depth of the draw-bar head. The journal of the coupling-link is carried out from the central portion of the opposite side of the head. This arrangement of parts secures the positive engagement of the coupling-jaws not only when the draw-heads come together in the same horizontal plane, but provides for the largest difference in planes of meeting possible to a heavily-laden car coupled to one wholly empty. This advantage is of the utmost importance in couplings of this class. For lack of this high and low ability of engagement many of the couplings heretofore devised are largely inoperative. Dispensing entirely with springs, the coupling-link here used is made of solid metal, so heavy that gravity quickly acts upon it when released from support. By pivoting it to swing vertically and yet engage horizontally with its contacting-jaw in a broad, smooth vertical face a two-fold advantage is secured. The engaging-jaw is also most securely braced and strengthened beyond all ordinary accident, the inclined forward face thereof not only operating to carry the link-hook up to its apex, but also acting in the most perfect way as a powerful brace in support of the working-face, against which the whole strain of the draft is exerted.

The inventor claims this form of coupling to be simple, strong, durable, and automatic in its action; to be free from complicated mechanism, and attachable to cars of any construction and to draw-heads of any form in common use, at small expense. It is also claimed for the device that in the event of derailment the cars will uncouple, which is a most desirable feature of any coupling device. The coupling can be readily attached to any car, and can be used in connection with the ordinary link-and-pin coupling.

Brown's Roll for Reducing Old Rails.

JOHN H. BROWN, of Bay View, Wis., is the inventor of an improved roll for reducing old rails, which is herewith illustrated and described. The invention provides a system of utilizing old steel rails of any length, from a broken piece a foot long to a full-length thirty-foot rail, whereby they are "broken down" and converted into merchant steel of square-edged "flats" without showing any seam whatever; and it consists of three rolls having peculiar conformations on the circumferences whereby this object is accomplished. Heretofore the utilization of old steel rails has been attempted, and what are known as "billets" have been made therefrom consisting of square bars of steel; but these billets have shown seams where the flanges of the rails had been broken down against the web or stem in the formation of the billet, and this is a serious objection, to obviate which the present invention is devised. Another system is to cut a rail into three parts by separating the flange and the head, or "tread," by cutting from the web or stem; but this leaves the old rail in three pieces, whereas with the present invention all of the metal of the old rail is utilized in the formation of the flat, and that, as stated, without showing any seam.

The accompanying cut on the following page is a vertical central section of the improved breaking-down rolls.

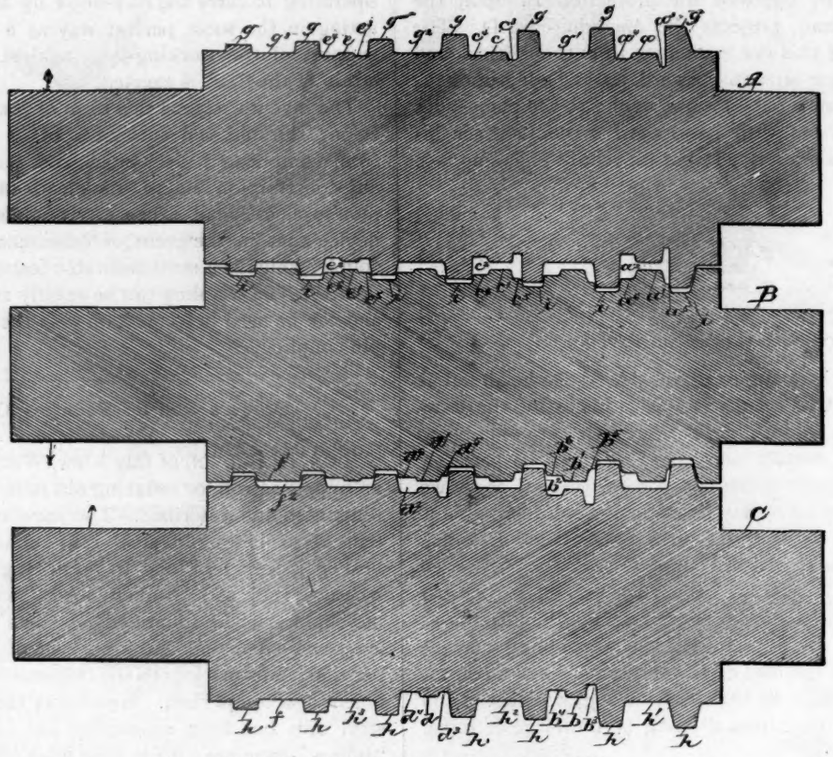
The breaking-down rolls are three in number, A, B and C, and the rolls A and C, are geared so as to revolve in the same direction, while the roll B, intermediate therewith, is geared so as to revolve in the opposite direction, as indicated by the arrows, the train of gears for accomplishing this object being of the well-known and ordinary construction common to rolling-mills. The roll A, is provided on its operative part between its journals with

seven circumferential guiding collars *g g g*, etc., of different and gradually diminishing diameters from one end toward the other, as shown. Between the first two of these guiding collars *g g*, is an operative collar *a*, while the space between the second and third guiding collars *g g*, as shown from right to left in the cut, is a blank or even surface *g'*, and so on, the blank even spaces *g' g² g³*, alternating with the operative collars *a c* and *e*, while on each side of these operative collars are circular depressions or circumferential grooves of different depths, marked *a³ a⁴*, *c³ c⁴*, and *e³ e⁴*, respectively, these pairs of grooves growing, generally, shallower from right to left, as shown.

The roll B, is provided with seven deep circumferential guiding grooves *i i i*, etc., to admit of the guiding collars *g g*, of the upper roll A, revolving therein, and consequently these grooves *i i*, grow shallower from right to left, corresponding with the decreasing diameters of the collars *g g*. Between the first and second grooves *i i*, always counting from right to left, are other and shallower grooves *a⁵ a⁶*, of different depths, having between them the relatively raised portion *a'*, of the same diameter as that of each end of the roll B. Between the second and third grooves *i i*, are the grooves *b⁵ b⁶*, and intermediate higher portion *b'*, of the same diameter as the portion *a'*, just described, and so on, the roll being provided between others of its grooves *i i*, with the grooves *c⁵ c⁶*, *d⁵ d⁶*, and *e⁵ e⁶*, and intermediate portions *c' d'* and *e'*, respectively, up to the point between the last two of the guiding grooves *i i*, which is free from other grooves, but has the level portion *f'*, only.

The roll C, is more nearly a counterpart of the roll A, except that the arrangement of its collars and its circumferential grooves and blank or even spaces is alternate with relation to the position of like parts in the roll A. It has seven guiding-collars *h h*, etc., corresponding to the guiding-collars *g g*, of the roll A, three smooth or even surfaces *h' h² h³*, and an extra even surface *f*, at the left-hand end, between the last two guiding collars *h h*, and hence two instead of three operative collars *b* and *d*, and grooves *b³ b⁴*, and *d³ d⁴*, respectively, on each side of the operative collars.

The operation of the device is as follows: The steel rail or section thereof to be broken down is introduced at the point *a²*, between the rolls A and B, which, as stated, revolve in opposite directions, and carry the rail between them, slightly breaking it down; and then the rail is brought back through the space *b²*, between the rolls B and C, similarly revolving in opposite directions to each other, and next the rail is carried through at the point *c²*, brought back at the point *d²*, carried through the point *e²*, and finally brought back at the point *f²*, which results in the production of a "flat" of steel made from the original rail without the slightest seam or any evidence of its original shape at the beginning of the operation.



BROWN'S ROLL FOR REDUCING OLD RAILS.

The rolls A B and C, are made of cast iron.

The steel "flats" produced from the old rails by these rolls and system of operating the same can be manufactured into the following-named articles: No. 4, No. 5, and No. 6 wire rod; also, one-fourth, five-sixteenths, and three-eighths inch "rounds" and "squares;" also, three-fourths up to two inches in width and three-sixteenths up to seven-sixteenths inch in thickness of round-edge tire; also, the same proportions of square-edge flats, and also into hoops and bands from one to four inches in width, and from No. 14 gauge to three-sixteenths of an

inch thick; hence it is claimed that the improvement is of great value in utilizing what has heretofore been largely waste material.

It is also claimed by the inventor that his system of reducing old rails can be operated at far less expense than the systems now in vogue.

Stetzer's Spring Piston-Packing Ring.

VALENTINE F. STETZER, of Toledo, O., is the inventor of an improved spring piston-packing ring, which is herewith illustrated and described. The invention is designed for use in such places as steam and pump-cylinders, each ring being preferably made entirely from one piece of material, generally of cast iron or of brass, and forming its own expanding or contracting spring, as the case may require, and at its point of severance forming a liquid, gas, or fluid-tight joint or lap, and being made in such a way and by such a process that the ring shall present to the surface of the cylinders against which it presses a perfectly circular form of bearing.

Fig. 1.

Fig. 2.

STETZER'S SPRING PISTON-PACKING RING.

In the manufacture of spring-rings of various kinds by the old processes it is a well-known fact that they are finished in a circular form, which in diameter is slightly larger than the diameter of the bore of the cylinder in which they are to be used, and after being so finished are cut open, generally diagonally, but in a few instances radially, and in cases of the diagonal cut have no tight joint at the opening of the ring, and in cases of the radial cut a joint is often formed by the insertion of a tongue between the cut surfaces in a well-known manner. Rings thus constructed slightly larger in diameter than the diameter of the cylinder in which they are to be used are sprung into the cylinder by compression, which distorts

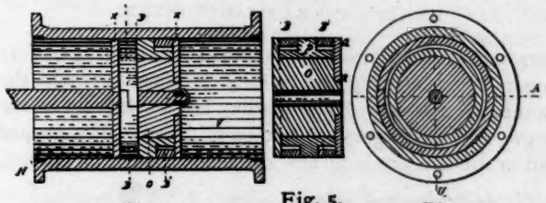


Fig. 3. Fig. 5. Fig. 4.

STETZER'S SPRING PISTON-PACKING RING.

the circular form of the ring, making it imperfectly fit the cylinder. To obviate this effect and to produce a ring having the qualities before stated—which is, first, the production of a ring which when sprung into the cylinder shall make a true concentric and as nearly a perfect fit as the present arts of construction will permit; and, secondly, to make a true and perfectly-tight joint at the opening or point of severance of the ring—are the primary objects of the present invention.

In the accompanying cuts, Fig. 1 is a perspective view of the spring piston-packing ring, showing the cuts on the open side closed; Fig. 2 a perspective view of a section of the ring, showing the cuts on the open side as the ring appears when expanded to its fullest extent; Fig. 3 a longitudinal section, on the line A in Fig. 4, of a steam-cylinder and its piston-head, the latter being the improved spring piston-packing ring, one of which, B, is shown in section and one, B′, has shown its exterior or circular surface, the latter for the purpose of more clearly showing the cut and lap on its open side; Fig. 4 a cross-section of Fig. 3 on the line D; Fig. 5 an entire sectional view, on the line U in Fig. 4, of the piston-head and its rings B and B′; Fig. 6 a vertical section of a packing-cap and a plunger to a pump on the line E in Fig. 7, embodying an application of the piston-packing ring, the piston-rod having its exterior surface shown instead of being in section, and Fig. 7 a cross-section on the line F in Fig. 6.

In Fig. 1 is shown the construction of the piston-packing ring. This ring is preferably made of hard cast iron or of hard brass, but may be made of any suitable material,

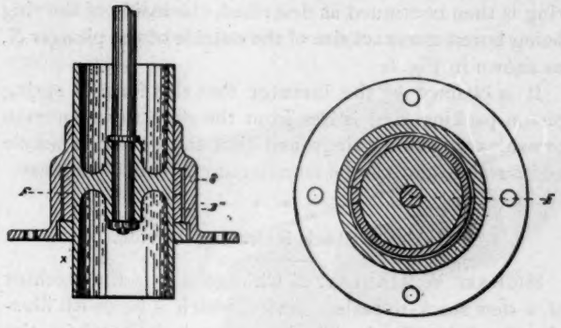


Fig. 6. Fig. 7.

STETZER'S SPRING PISTON-PACKING RING.

which may be cast, rolled, or by any analogous process prepared in a circular form of the proper proportions for the completion of a finished ring. The surfaces G H, are first made perfectly true, smooth and parallel, which constitutes the final finishing of these surfaces, being of the proper breadth to fit into its place in the piston-head in which it is to be used. Two radial cuts I J—shown in Fig. 2, one on each side of the ring and each extending, preferably, about one-half way through, and to the extent of meeting each other, for the purpose of severing the ring and the formation of the lap shown at K, in Fig. 1—are next made. The overlapping surfaces I′ and J′, having thus been formed, they are then ground or scraped, or in any suitable way made to fit truly together, still maintaining the parallelism of the sides G H. The ring is then sprung together, as shown at K, in Fig. 1, thus forming an inherent spring of the same metal and making a close joint, which is at all times maintained until the ends of the ring are so far separated by wear as to uncover the lap, which never occurs in use. While held in this closed position the ring is truly bored on its inner surface L, and turned or trued on its outer surface M, the latter to the exact size of the cylinder-bore V, in which it is to be used.

It is obvious that when the ring is sprung together and truly turned on its outer diameter to fit the bore of the cylinder in which it is to be used, the outer surface or periphery of the ring will be concentric with the bore of the cylinder and a perfect fit from the start, and being such a fit at the commencement of its course these relations will be maintained by the future wear of the parts.

In Figs. 3, 4, 5, 6 and 7 are shown applications of this ring. In Figs. 3, 4 and 5 are shown a steam-cylinder and a piston-head, in which N is the cylinder, and O P Q the piston-head, in three parts, supporting the rings B and B'. In this application the rings B and B', expand outwardly against the inner surface V, of the cylinder N. In Figs. 6 and 7 is shown an application of the piston-packing ring to a pump, wherein the ring B''', contracts inwardly instead of expanding outwardly, the principle and operation being identical, the operation of constructing the ring only being slightly different, and is as follows: After the operation of constructing the ring, as before described, has been carried to the extent of finishing the surfaces of the lap I' J', the ring is expanded with a hammer or other suitable instrument upon its outer surface M, which causes the ring to be closed, as shown in Fig. 1. The operation of completing the ring is then continued as described, the inside of the ring being bored the exact size of the outside of the plunger X, as shown in Fig. 6.

It is claimed by the inventor that this form of spring piston-packing ring is free from the objections common to ordinary packing rings, and that the device is simple and durable, and can be manufactured at small expense.

Hanley's Stock-Releasing Device.

MICHAEL W. HANLEY, of Chicago, Ill., is the inventor of a new stock-releasing device, which is herewith illustrated and described. The invention is designed for the purpose of liberating stock, horses, etc., which may be in a barn or stable at the time of a fire, and not only releases them from the stalls, but alarms them, causing

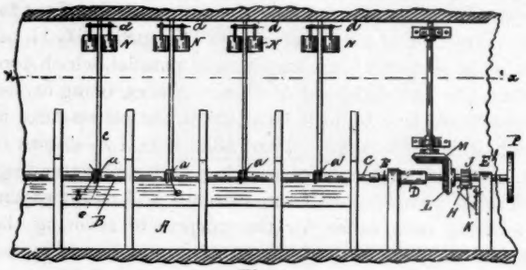


Fig. 1.

HANLEY'S STOCK-RELEASING DEVICE.

them to run out of the stall. It also enables one man to liberate all the stock, whether one or one thousand head, in a very few seconds. It is therefore of utility in street-railway stables, and other buildings where a large number of horses or other stock are kept.

In the accompanying cuts, Fig. 1 is the inside sectional view of a barn or stable furnished with the improved stock-liberator; Fig. 2 a plan section of the same, taken on the line *x x* in Fig. 1, showing the operation of the liberator on two sets of stalls; Fig. 3 a vertical section of the same, taken on the line *y y* in Fig. 2; Fig. 4 a detail elevation of part of the sleeve and sliding or locking bar; Fig. 5 a plan section of the same on the line *x x* in Fig. 4; Fig. 6 a detail section of Fig. 4, showing the parts locked with the alarm attached thereto; Fig. 7 a detail elevation of the alarm and its connections, and Fig. 8 a detail elevation of the sliding or locking bar.

A is the stall or manger; B the sleeve or tube through which the sliding or locking bar C, works; E is the shaft for working the same, and N is the alarm. By means of the mechanism which is provided, the liberating of the stock may be done either from the inside or the outside of the building, or from above or below the stable-room.

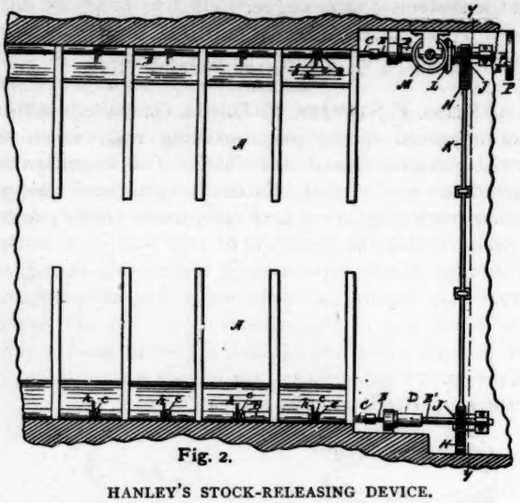


Fig. 2.

HANLEY'S STOCK-RELEASING DEVICE.

Running along the head of the stalls is the sleeve or tube B, arranged with openings *a*, at proper intervals—*i. e.*, one in the center of that length of sleeve which crosses each stall. In this sleeve or tube there is a sliding or locking bar C, which runs the full length of the

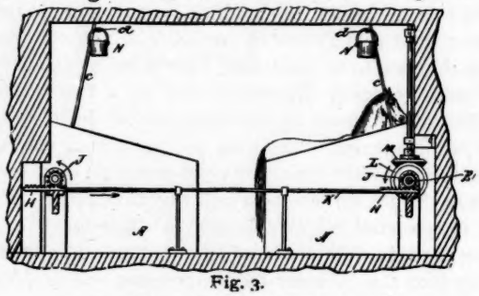


Fig. 3.

HANLEY'S STOCK-RELEASING DEVICE.

sleeve or tube. This bar is furnished with hooks or fingers *b*, for catching and locking the rings to which the halters are fastened. The sliding bar fits tightly in the sleeve, and the fingers are formed by cutting an L-shaped slot in the bar, the long arm of this slot being parallel to

Fig. 4.

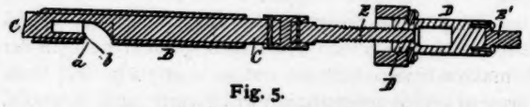


Fig. 5.

HANLEY'S STOCK-RELEASING DEVICE.

the longitudinal axis of the bar, and longer than the width of the opening *a*, in the tube. At the end from which it is desired to operate the liberator, the sliding-bar C, is connected with a shaft E, with a screw-thread. There is a nut D, fitted with a female screw-thread through which the shaft E, works. This nut is grooved on its outer cir-

cumference, and by means of this groove it is set in a fixed plate, which restricts any lateral motion of the nut. This nut is attached to the shaft E′, which has on its outer end a hand-wheel P, by which the nut is turned off and on the sliding-bar, and as the nut D, is held from longitudinal movement, it is obvious that the locking bar C, will be caused to slide in and out of the sleeve B. The bar C, is made with a spline or feather which runs in a groove in the sleeve B, and prevent the bar from turning. The bar and sleeve might both be made square, or any suitable device used to prevent the bar from turning.

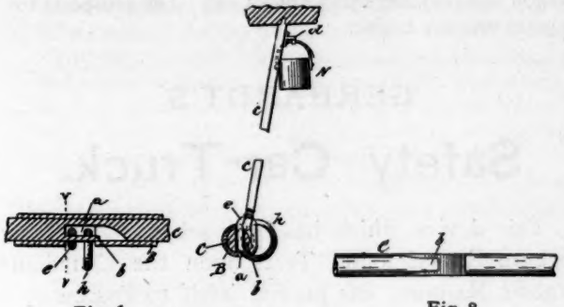


Fig. 6. Fig. 7. Fig. 8.

HANLEY'S STOCK-RELEASING DEVICE.

Attached to the nut-shaft E′, is a gear-wheel J, which engages with the rack H, attached to the rod K. This rod moves forward and backward longitudinally in fixed bearings, and it is at right angles to the sliding bar. As the rod runs by several rows of stalls, several shafts running in sleeves and having gears attached to them may be worked by the nut-shaft E′, and hand-wheel P, there being several racks attached to the rod K, each working a pinion attached to the nut-shafts E′. If it would seem desirable to work the sliding bars either from above or below the floor on which the stalls are situated, the nut-shaft may be furnished with a bevel-gear L, which engages with a similar bevel-gear M, on the end of a shaft extending above or below, as desired.

The cattle in the stable are tied by their halter-straps to rings *h*. These rings are held by the fingers or hooks *b*, attached to the sliding bar C. When it is desired to put in the rings, the sliding bar is run into the sleeve, so as to carry the fingers *b*, far enough along in the opening *a*, to allow the ring or link *h*, to be hooked onto the finger. The sliding bar is then run forward again until the finger extends across the opening and the ring is held in place. There is a rod *c*, which is furnished with a hook *d*, near its upper end, and a ring *e*, at the lower end. The ringed end of the rod is fastened to the finger, together with the ring to which the halter-straps are fastened. The other end of the rod fits into a socket-hole in the wall or ceiling of the stall above it and at its head. To the hook, near the end of the rod, is hung a tin can N, filled with stones.

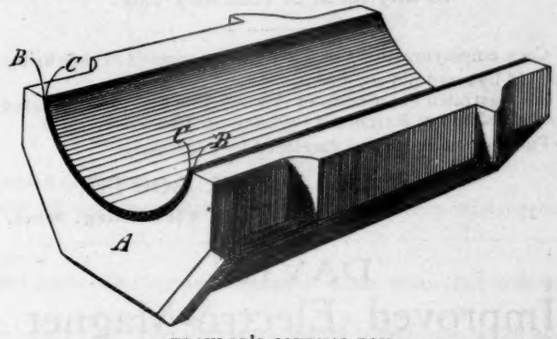
When it is desired liberate the stock, the sliding bar is run into the sleeve by the mechanism already described. As soon as the finger *b*, has passed the opening *a*, the ring *h*, to which the halter is tied, and also the ring *e*, at the end of the rod *c*, are released and fall to the ground by reason of their own weight. When the rod *c*, falls, the tin can N, full of stones, comes down at the horse's head and causes him to back out of the stall, thus letting him see that he is free, and in the general confusion a stampede will naturally be made for the door, many head of stock or horses thus being saved that would otherwise be burned up in case of fire.

The inventor claims his device to be simple and reliable, there being no complicated mechanism connected therewith which would be liable to derangement.

Traylor's Journal-Box.

ROBERT W. TRAYLOR, of Richmond, Va., is the inventor of an improved journal-box or bearing for car-axles and other purposes, which is herewith illustrated and described. The object of the invention is to provide a bearing with an anti-friction surface, and at the same time let the anti-friction metal quickly adjust itself by reason of its soft cushion of lead to the irregularities of an axle or journal.

The accompanying cut represents a perspective view of the device.



TRAYLOR'S JOURNAL-BOX.

A represents the end of the brass bearing; B B represent the visible line of the lead cushion, and C C represent the end view of the Babbitt. To cast or form the journal-box or bearing, an ordinary brass bearing or bearing of like composition is taken and its bearing-surface tinned. A proper form with a convex face is then placed and fastened near the bearing-face of the bearing, leaving between the bearing-surface and the convex face a suitable space, into which the melted lead can be poured. The melted lead is then poured between the convex face and the bearing-surface. When the lead has sufficiently cooled, the form is removed and another proper form with a larger convex face placed and fastened, leaving between the lead face, formed as above stated, and the convex face of the last-mentioned form, a suitable space into which the melted Babbitt can be poured. The melted Babbitt is then poured into the last-mentioned space, and thus a well-welded bearing of these metals is obtained.

This form of journal-box or bearing is claimed by the inventor to be simple, durable and inexpensive, and it is further claimed to be the only anti-friction self-fitting bearing made.

THE Florida Southern road is now laying eighty miles of steel rails in place of the iron ones now in use, and to avoid all delay in the running of their trains they have fitted up an electric light machine, mounted on a flat-car, run by a five horse-power engine, and the work of replacing the track is being done at night by an electric

light. The dynamo is capable of furnishing three brilliant lights stretched along the track by poles, which will furnish a good light for more than a mile, thus enabling a very large force of men to work. Another machine similar to this one is being put on at the other end of the road. The reflector, or search light, throws its rays for a half-mile ahead, and a newspaper can be read by its light a quarter of a mile away. These lights will also be used on the new lines of the Florida Southern, where a double force of men will be put on laying the track.

RIEHLÉ BROTHERS, proprietors of the Philadelphia Scale and Testing Machine Works, report the following orders received during the past few days, viz.: Two testing machines for the University of California; one testing machine for Yale College; one cloth tester for Messrs. Hood, Bonbright & Co., of Philadelphia; one improved hay rope twister for the Detroit Pipe and Foundry Company; one improved hay rope twister for the Schuckle, Harrison & Howard Foundry Company, St. Louis; one improved hay rope twister for the National Pipe and Foundry Company, Scottdale, Pa.; one testing machine for Messrs. Wm. Clark & Son, Pittsburgh; a furnace charging scale for the Ohio Iron and Steel Company, Lowellville, Ohio; a rolling-mill scale for the Lebanon Rolling Mill, and many orders for wagon and portable scales, trucks, etc. The prospects for a good year are bright.

Cuneo's Car-Coupling.

Simple, Automatic in its Action, and applicable to any form of Railway-Car.

Cars employing this Coupling can be coupled to cars using the old link-and-pin coupler.

An illustrated description of this valuable Coupling appeared in the AMERICAN RAILROAD JOURNAL for December, 1885.

Full particulars will be furnished by addressing

R. V. BOOTH,
Vicksburg, Miss.

DAVIS'
Improved Electro-Magnet
For Railway and other Signals.

By means of this improved instrument, a full description of which was published in the November JOURNAL, the armature which carries the signal will be turned into one position whenever the circuit is closed, and automatically turned back by a suitable spring whenever the circuit is open, provided one Electro-Magnet is used; while if two Magnets are used the position of the signal will depend entirely upon the current that passes through either one of the Magnets.

The Magnet can also be placed in any position to operate all the different kinds of signals either in revolving or lifting.

It is especially adapted for use in railway signaling.

The inventor will dispose of this valuable patent at a low figure. Address

WILLIAM E. DAVIS,
571 Third St., Jersey City, N. J.

GERHARDT'S
Safety Car-Truck.

This device, which has been subjected to Two Severe Experimental Tests upon the Canadian Pacific Railway, has proved itself to Possess

ALL THE REQUIREMENTS

OF A

Perfect Safety Truck-Appliance.

In the event of Derailment, the Truck remains in its proper position with respect to the Car; and in event of Broken Axles, the Truck-Frames are kept Parallel to the Car.

It can be applied to Freight-Cars of all kinds, to Passenger and Sleeping-Cars, and to Locomotives and Tenders.

A Full Illustrated Description of the Car-Truck appeared in the AMERICAN RAILROAD JOURNAL for October, 1885.

Full particulars will be furnished by addressing:

S. DAVIS,

P. O. Box, 447, MONTREAL, CANADA.

WOLCOTT'S
PATENT
Dumping-Car and Car-Dump.

This invention furnishes a means for unloading Grain, Coal, Ores, and other Freight, from Platform Gondola or Box-Cars, and by its use one or more Cars can be dumped at the same time by an extended Dump-Track which may be coupled out to any desired length.

A full description of both devices, with their application, was published in the November JOURNAL.

For particulars, address the Inventor and Patentee,

ANSON WOLCOTT, Wolcott, Ind.

General Offices THE ROTE AUTOMATIC BRAKE COMPANY,

Mansfield, Ohio, *November 3d, 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

Gentlemen:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake.* This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners, to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.

Simplicity.

Freedom from breakage.

Certainty of action.

Effectiveness.

Cost of maintaining.

"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains:

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner,* so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most horoughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like people everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,

Per M. D. Harter, President.

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